NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

ORGANIZATIONAL ASSESSMENT OF THE DEPOT
LEVEL ANALYSIS CENTER FOR THE
LOCKHEED S-3 VIKING AIRCRAFT

by

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September 1987

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REPORT DOCUMENTATION PAGE

REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b RESTRICTIVE MARKINGS
SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited
DECLASSIFICATION/DOWNGRADING SCHEDULE	
PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
NAME OF PERFORMING ORGANIZATION val Postgraduate School — 6b OFFICE SYMBOL (If applicable) Code 54	7a NAME OF MONITORING ORGANIZATION Naval Postgraduate School
ADDRESS (City, State, and ZIP Code) nterey, California 93943-5000	7b ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000
NAME OF FUNDING/SPONSORING ORGANIZATION — 8b OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
ADDRESS (City, State, and ZIP Code)	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO / PROJECT NO / TASK NO / WORK UNIT ACCESSION NO

TITLE (Include Security Classification)
GANIZATIONAL ASSESSMENT OF THE DEPOT LEVEL ANALYSIS CENTER FOR THE CKHEED S-3 VIKING AIRCRAFT

PERSONAL AUTHOR(S)
ghtaian, Gregory and Keese, Howard C.

TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month Day)	15 PAGE COUNT
ster's Thesis	FROM ______ TO _____	1987, September	98

SUPPLEMENTARY NOTATION

COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Naval Aviation Maintenance Program (NAMP); Data Analysis

ABSTRACT (Continue on reverse if necessary and identify by block number)

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DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION Unclassified
NAME OF RESPONSIBLE INDIVIDUAL rof. Nancy Roberts	22b TELEPHONE (Include Area Code) (408) 646-2742 — 22c OFFICE SYMBOL Code 54Rc

ORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete

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MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the

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Recommendations are provided for the structure of such an organization.

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I. <u>INTRODUCTION</u>

A. THE NECESSITY FOR AN ORGANIZED MAINTENANCE EFFORT

Aviation is a most demanding and unforgiving discipline. Demanding in that it requires constant attention to detail and unwavering adherence to its laws. Unforgiving in that any failure to strictly abide by these same laws will most often result in catastrophic and usually deadly consequences.

Aviation makes its demands equally of both man and machine. The failure of either to adhere high standards usually yields the same net result. Naval aviation is no exception. On the contrary, it is even more demanding and more readily imposes its penalties for any breach of its even more restrictive standards. Maintaining these high standards for its aircraft is the foundation for the United States Navy's Naval Aviation Maintenance Program (NAMP).

B. THE NAVAL AVIATION MAINTENANCE PROGRAM

The Naval Aviation Maintenance Program is designed around three levels of maintenance activity. In order of increasing complexity, they are Organizational, Intermediate, and Depot Level maintenance. (Although a discussion of the entire three-tiered system follows in Chapter II, a brief overview of the system now will assist in gaining perspective on this study). It is at the depot

level that the most complex systems, sub-systems, and components of the aircraft are decomposed and then replaced, repaired, or otherwise reconditioned as necessary.

Currently there are six depot level maintenance activities in the United States Navy. These vast and complex organizations are each known as a Naval Air Rework Facility, or NARF. The NARF can either be government owned and operated, government owned and contractor operated, or contractor owned and operated. All such facilities operate fully under the jurisdiction and responsibility of the Commander Naval Air Systems Command (NAVAIR) who is responsibility to the CNO for its overall management.

The work performed at the depot level is the most complex of the three levels; it requires an exceptional level of expertise in the entire aircraft (hereafter referred to as the weapon system). Major life cycle management decisions for the weapon system are made based upon recommendations from the depot. These decisions not only include the replacement, addition, deletion, and modification of any and all components, but also the methods and procedures for doing so. Fundamental to this, and any decision-making process, is the gathering and analysis of relevant data upon which to base these decisions.

C. THE DEPOT-LEVEL DATA ANALYSIS FUNCTION

Simply stated, the primary purpose of depot level analysis is two-fold: first, to ensure that aircraft and

their mechanical components have been manufactured to their design specifications; and second, to determine through constant monitoring and analysis if these specifications were sufficient to ensure continued safe operation and thereby to prevent a catastrophic loss of life and aircraft.

The secondary purpose of the data analysis process is to determine if those components currently in use are the most economically feasible and if not, provide the impetus into an examination of other more cost-effective alternatives.

The analysis function is currently discharged through the Chief of Naval Operations written directive OPNAVINST 4790.2D which mandates the establishment and continued operation of a data analysis center at the depot level. The responsibility for the performance of data and trend analysis has been charged to the office of the Naval Aviation Systems Command (NAVAIR) Engineering Support Officer, better known as the NESO. The precise structure and modes of operation for this analysis center have been left to his discretion.

D. RATIONALE FOR THIS RESEARCH EFFORT

This study was authorized and funded under the auspices of the Office of the Naval Aviation Systems Command (NAVAIR) Engineering Support Officer (NESO) of the Naval Air Rework Facility, Alameda, California. Its purpose was the identification of an appropriate organizational structure for the analysis center at the depot level. More

specifically, the study was to be directed toward the operation of the Data Analysis Center for the Lockheed S-3 Viking aircraft at NARF ALameda.

Since it is not within the purview of the NESO to effect any organizational changes outside of his office, this study will concern itself only with implementable alternatives to the current internal organizational structure. In this light, any proposed change recommendations will be those that may indeed be implemented by the NESO at his option, without the necessity of approval of higher authority.

This research effort will entail an in-depth examination of the input, processing procedures, and output of the analysis center. After acquiring an understanding of the varied functions of and problems associated with the operation of the analysis center, a comparative analysis of the S-3 analysis center's operation with the operation of similar analysis centers will then be conducted. Other similar operations to be studied will include analysis centers located at other NARF's in the Navy and also similar operations within the private sector.

While this study was directed toward the operation of the Data Analysis Center for the Lockheed S-3 Viking aircraft at NARF Alameda, the findings will have at least general application to all such depot-level centers, as they share common goals. It is our hope that one outcome of this study will be the improved tracking and trend analysis of

those problems impacting the reliability, maintainability, and logistics support for the weapon system in the fleet.

II. RESEARCH METHODOLOGY

A. GENERAL APPROACH TO THE RESEARCH EFFORT

This assessment of the NARF Alameda S-3 Data Analysis center made use of qualitative methods of research. The vast majority of the study consisted of interviews, both informal and structured, and some observation. During the course of this research, the authors were granted free access to the NARF facilities and personnel. Interviews were conducted with current staff members of NESO organization, the S-3 analysis center, other weapons system analysis centers resident at NARF Alameda, and members of other departments at NARF Alameda with which the S-3 analysis center has critical interfaces. Through the office of the NESO, NARF Alameda, access was given to analysis centers at other NARF's within the Navy, and also the Reliability Maintenance Division of American Airlines, San Francisco, California. A brief description of the research methodology follows.

1. Informal Interviews

The cornerstone of this study was the informal interview. These interviews were in both structured (Appendix A) and unstructured form. The data accumulated from these structured interviews provided the primary means

of comparative analysis of the various data analysis centers.

While employed extensively, the structured interview was often used as a departure point for informal and spontaneous question and answer sessions. Often the informal interview was used exclusively on follow-up contacts with the interviewees. Many times the interviewee was allowed to steer the general direction of the questioning by selecting a major point for emphasis and exploration that he felt meaningful. By granting this degree of latitude to the interview sessions, not only were new, significant areas of inquiry found, but the researchers' overall understanding of the complex nature of depot-level analysis was meaningfully improved.

2. <u>Observation</u>

By direct observation of the various analysis centers in operation, a sound understanding of the exact nature of the task was gained. Additionally, such observations were essential in the researchers acquiring a knowledge of the external interfaces with the analysis center.

3. <u>Participant Observation</u>

While not one of the major methodologies used in this research effort, a modest amount of the research was conducted via participant observation. To gain an precise understanding of the exact nature of data retrieval, the

researchers were given instruction and practice in accessing and manipulating the computer hardware and software databases utilized by analysis center personnel.

4. Archival Research

To understand the U.S. Navy's directives dealing with aviation maintenance and depot-level analysis, the technical reference library of the NESO, NARF Alameda were used extensively. In addition, certain applicable local directives governing the operation of each analysis center were supplied by their respective offices.

The survey of current organizational design theory utilized the Dudley Knox Library of the Naval Postgraduate School, Monterey, California, the personal library of Dr. Nancy C. Roberts, Ph.D., and the personal libraries of both researchers.

5. Historical Analysis

In order to gain some insight into the current evolution of the S-3 analysis center's organizational design, limited historical analysis was conducted. This consisted of both informal interviews with personnel who had been with the center for a number of years and an examination of specific documents pertaining to the operation of the center within the past ten years.

B. LOCATIONS OF RESEARCH

The research into the operation of the analysis centers of NARF Alameda, California, NARF Pensacola, Florida, and

NARF Norfolk, Virginia was conducted in person at these centers' respective locations. The studies of the analysis centers of NARF Cherry Point, North Carolina and NARF Jacksonville, Florida were conducted via interview with key personnel from these centers while they were attending various conferences at NARF Pensacola, Florida. Subsequent follow-up interviews were conducted both in person and via telephone. The interview with the supervisor of Reliability Maintenance of American Airlines, San Francisco, California was conducted entirely via telephone.

C. DATA COLLECTION

In addition to interviewing the branch supervisors of the previously mentioned analysis centers, key personnel at NARF Alameda were also interviewed. These included personnel assigned to data processing support of NARF Alameda and personnel assigned to the P-3 Weapons Engineering Division of NESO Alameda.

III. OFFICIAL DIRECTIVES AND POLICY GOVERNING THE DATA ANALYSIS FUNCTION

A. ORIGINS OF THE NAVAL AVIATION MAINTENANCE PROGRAM

May 26th, 1959 marked a new era for the maintenance process in United States Naval Aviation. It was on this date that the Chief of Naval Operations (CNO) established the Naval Aviation Maintenance Program (NAMP). The objective of this program was to provide an integrated support system for the performance of aeronautical equipment maintenance and all related support functions. For the first time, a uniform and systematic approach would be taken toward the performance of all maintenance-related activity on all the aircraft of the United States Naval Air Force.

The program was designed to be dynamic and all-encompassing. It's stated purpose is as follows:

> The objective of the NAMP is to achieve and maintain maximum material readiness, safety, and conservation of material through command attention, policy direction, technical direction, management, and administration of all programs affecting activities responsible for aviation maintenance, including associated material and equipment. It encompasses the accomplishment of repair of aeronautical equipment and material at the level of maintenance which will ensure optimum economic use of resources; the protection of weapons systems from corrosive elements through the prosecution of an active corrosion control program; the application of a systematic planned maintenance program; and the collection, analysis, and use of pertinentdata in order to effectively improve out material readiness and safety while simultaneously increasing the efficient and economical management of our human, monetary, and material resources. [Ref. 1:p. 1].

Established to promulgate maintenance policies, responsibilities and procedures for the proper conduct of all levels of maintenance throughout Naval Aviation, the NAMP is the basic document and authority under which this system is managed. The dynamic nature of the NAMP lends it the ability to undergo continual revision as necessary in order that it may incorporate any new or improved methods and techniques which may aid in achieving its stated objectives.

The NAMP embraces all Navy and Marine Corps activities that deal with the operation, maintenance, rework, repair, production, and support of aircraft. In addition to the maintenance of its aircraft, the NAMP further provides support to photographic equipment, air launched weapons, missile targets and aeronautical equipment.

B. THE THREE LEVEL MAINTENANCE CONCEPT

Providing the management tools required for an efficient and economical use of personnel facilities, material and funds, the NAMP established a three-level maintenance concept: organizational, intermediate, and depot. These maintenance levels were established in order to provide common standards which can be applied to the many aircraft maintenance activities.

1. Organizational Level Maintenance

Organizational Level Maintenance is that maintenance which is accomplished on a daily basis by the aircraft

custodians, i.e., aircraft squadrons in support of their own daily operations. Typically this level of maintenance is referred to as "on-equipment" repair, to include the removal and replacement of defective components and parts. Of equal importance at the organizational level is the preventative maintenance effort. These functions are performed by maintenance personnel assigned to the aircraft squadron and specifically include but are not necessarily limited to:

- Inspecting;
- Servicing;
- Lubricating, replacing, and adjusting parts;
- Corrective and preventive maintenance;
- Record keeping and report preparation;
- Incorporation of technical directives for improvement to safety of flight.

2. Intermediate Level Maintenance

That maintenance which is the responsibility of, and performed by designated maintenance activities for support of using organizations (i.e., aircraft squadron) is known as Intermediate Level Maintenance. The intermediate level of maintenance concerns itself with the repair of the removable components. This type of maintenance activity is commonly referred to as "off-equipment" repair. The level of complexity and magnitude of this task is considerably greater than the organizational level. Functions and services performed at this level are the following:

- Calibration of designated equipment;
- Repair or replacement of damaged or unserviceable parts, components or assemblies;
- Test, inspection and modification of aeronautical equipment and related support equipment;
- Manufacturing of non-available parts;
- Technical assistance to support organizations;
- Incorporation of technical directives for improvement to safety of flight.

3. Depot Level Maintenance

The third level, and by far the most intricate and complicated is the Depot Level Maintenance effort. Maintenance accomplished at this level primarily involves aircraft/material that requires major rework or a complete rework of parts, assemblies, subassemblies and end items to ensure continuing flying integrity of airplanes and flight systems. At this level, the aircraft and all of its included systems are literally decomposed to their elemental level where they are then repaired, restored as necessary, preventative maintenance is performed as appropriate, and reassembled. The end result is a what amounts to be a "new" aircraft. This process is referred to as Standard Depot Level Maintenance (SDLM), and is analogous completely disassembling an automobile down to every valve and component part, replacing all wires and electrical components, repairing what is possible, replacing what isn't, and reassembling the vehicle. The completed maintenance supports both organizational and intermediate

levels by providing engineering assistance and performing maintenance tasks that are far beyond the capability of the lower levels. Functions and services at this level are as follows:

- Rework of aircraft airframes and systems not physically removed from the aircraft according to the engineering specifications outlined under the Standard Depot Level;

- Maintenance (SDLM) Program;

- Rework of missile guidance and control systems;

- Rework of power plants (engines);

- Rework of removed aviation components and systems;

- Manufacture of designated items no longer in use and the design of modification change kits for aircraft and aeronautical equipment;

- Modification of aircraft;

- Aircraft support services which included the following programs:

- Salvage;

- Preservation and depreservation;

- Acceptance and transfer of aircraft;

- Calibration;

- NAVAIR Engineering Support Office (NESO) services.

C. THE MAINTENANCE MATERIAL MANAGEMENT SYSTEM

In an effort to provide greater accountability and improve resource utilization in the maintenance effort, the Maintenance and Material Management (3M) system was implemented on January 1, 1965. The intent of the 3M system was to provide for man-hour accounting, aircraft accounting,

and the collection of that data as deemed significant to the maintenance effort.

Armed with this information, decision-makers were provided with a means, however imperfect, of assessing the reliability and maintainability of critical aircraft components. Hand in hand with this, management could now discern the impact of the failure of an individual component in terms of not only aircraft "down time," but also manhours required to effect the necessary repair. This manhour accounting also provided a method to effectively gauge utilization of key personnel within a workcenter and yielded a more sound basis for making staffing decisions. The impact of a non-responsive supply system would also be made more readily apparent.

D. ADVENT OF OPNAV 4790

With the passage of time and a realization of the growing importance of an accountability reporting system, the various policies, directives, regulations, instructions, and generally accepted practices grew such that it was a monumental task to be kept abreast of even the most current guidance from various offices of higher authority. Resolving conflicts, contradictions, and inconsistencies became virtually impossible. Realizing this, in January 1968, the CNO directed that all naval aviation maintenance-related programs in early 1968 into a single, cohesive, command-oriented document. In reality, this single

document was actually a central reference library. Copies of this library were to be maintained at each maintenance activity. The result of this consolidation was the issue in July 1970 of the four volume OPNAVINST 4790.2. The current instruction now in use is OPNAVINST 4790.2D.

Known as simply "the 4790," this document provides the basis for the entire maintenance effort. It identifies and delineates critical functions and their respective responsible parties. It establishes the organizational structure for each of the three levels of maintenance. The prescribed organizational structure for the depot level maintenance activity is depicted in Figure 3-1.

E. THE OFFICE OF THE NESO

The 4790 specifically charges the office of the NESO with the responsibility for data analysis. To gain an effective understanding of how the analysis function is integrated into the macro organization of the NARF, we must examine the office of the NESO and its cognizant duties and responsibilities.

Reporting directly to the commanding officer of the depot, this position is classified as a senior management level position. Such a position serves to provide close communication, coordination, and advisory assistance to the commanding officer on matters concerning his respective department.

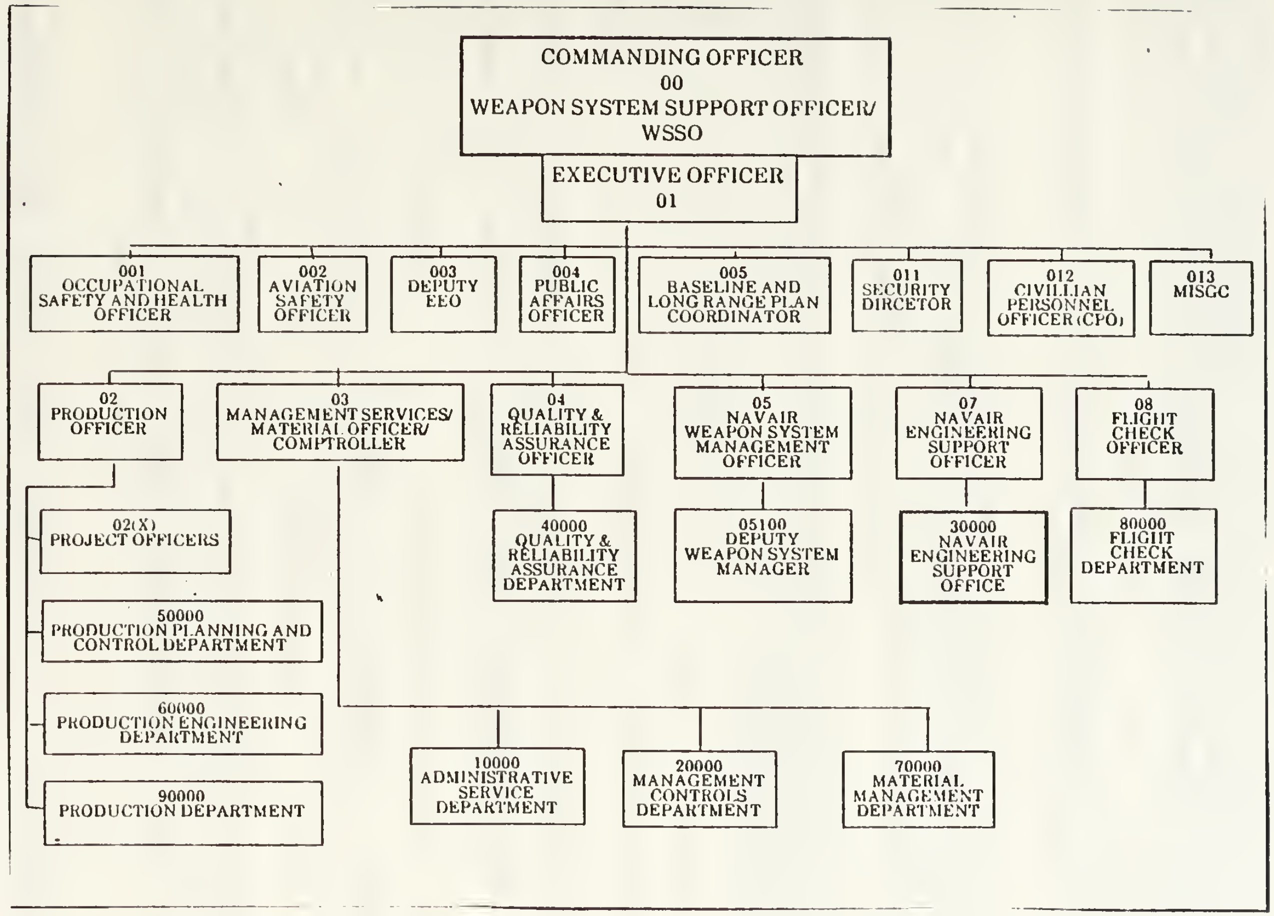

Figure 3-1 Naval Aviation Rework Facility Organization Alameda

The primary concerns of the NESO are matters dealing with aerospace engineering and the engineering functions for the assigned weapon systems and equipment. Other major responsibilities, as cited in the 4790, include:

- Accomplishment and coordination of engineering projects, weapon system designs and maintenance effects on designed weapon system platforms with NAVAIR and fleet command;

- Providing engineering services and support to local NARF's production efforts;

- Design and maintenance engineering responsibilities for designed weapon systems and equipment;

- Compliance with NAVAIR, CNO, and other directives;

- Policy and procedure recommendations for the improvement and effectiveness of the NESO in support of NARF's and fleet requirements.

In summary, this office provides for and directs engineering projects, coordinates design and maintenance engineering efforts on assigned weapon system platforms, and provides the aerospace engineering services in support of operating force organizations (i.e., squadrons) and the local NARF's production effort. Maintaining worldwide support, NESO is responsible for both the design and maintenance engineering of assigned weapon and systems and equipment. He also submits budget requirements to support designated functions.

To effectively discharge these vast and varied the responsibilities, the NESO relies extensively on 3M data. Without accurate, timely, and relevant data, the NESO simply cannot operate. For this reason, the responsibility for the

establishment and continued operation of the data analysis center is his.

F. RESPONSIBILITIES OF THE ANALYSIS CENTER

In addition to assigning the responsibility for the Analysis Center to the NESO, the 4790 also provides basic guidelines for the center's operation. As a minimum, the analysis center must discharge and control the following duties:

- Data analysis and support of scheduled and unscheduled corrective maintenance requirements and the appropriate revisions to rework requirements;

- Engineering data analysis of aircraft weapon systems, components and equipment in support of the engineering division in order to establish the necessary depth and scope of rework requirements;

- Functions as Analytical Maintenance Program (AMP) focal point;

- Verifies, identifies and records all problem areas which influence mission capability status, weapon system availability, safety, and maintenance resource expenditures;

- Evaluation of data systems, and analysis techniques which it incorporates and recommends changes to enhance its productivity and proficiency;

- Providing liaison support to the operational force maintenance organizations, it acquires their inputs on maintenance and other logistics support problems. Also it dispenses the rapid feedback necessary on corrective action status and problem solutions;

- As AMP coordinator, facilitates in the development of maintenance and rework requirements under its cognizance and constantly supervises the overall effectiveness of the maintenance plan.

G. SUMMARY

Through this brief history and overview of the more significant aspects of the NAMP with respect to data analysis, insight has been gained into the character of both the analysis center and the general organization within which it must operate.

IV. COMPARISON OF EXISTING ANALYSIS CENTERS

In this chapter the operation of five analysis centers will be examined. Four of these operations are located at other NARF NESO offices. The fifth is that of a commercial carrier, American Airlines. In studying the means others discharge similar responsibilities, the costs and benefits of alternative organizational designs can more readily be seen. Hopefully we can then glean that which is a positive contributor to a successful operation and avoid the detractors.

All analysis center investigations were conducted through personal structured interviews with the exception of American Airlines. Because of a demanding schedule, the supervisor of the American Airlines center was able to grant a telephone interview only.

The chapter will identify each analysis center's position within the organizational structure, its responsibilities as viewed by the supervisor, size, tasks performed and relationships with other branches and divisions.

A. NESO CHERRY POINT, NORTH CAROLINA

1. Structure

Presently, the analysis center of Cherry Point is located within the Technical Publications Division (Figure

4-1). Cherry Point's structure represents a decentralized arrangement in which the delegation of authority has been dispersed such that each branch operates as a self-contained unit [Ref 2:p. 376]. This decentralization enables subordinates to make decisions at a lower level resulting in a significant reduction in the workload of the Chief Engineer. There are three major levels in the hierarchical structure at Cherry Point. Within the analysis center work is divisionalized by aircraft platforms. Each aerospace technician is specialized in a particular weapon system resulting in resident experts for each system. This does not release the analyst from the responsibility for conducting inquiries on other weapon platforms when the need arises.

2. Purpose

The center performs analysis to identify and document problem areas significantly impacting all airframe, avionic, and power plant equipment for which it is the Cognizance Fleet Activity (CFA). This responsibility encompasses the AV-8 Harrier, OV-10 Bronco, C-130 Hercules, C-131 Samaritan, and H-46 Sea Knight aircraft system platforms. Providing fleet reported failure information to its' engineers in order to improve the aircraft's readiness, the analysis center attempts to reduce downtime for that particular platform. Furthermore, it evaluates systems using its analysis techniques in order to make

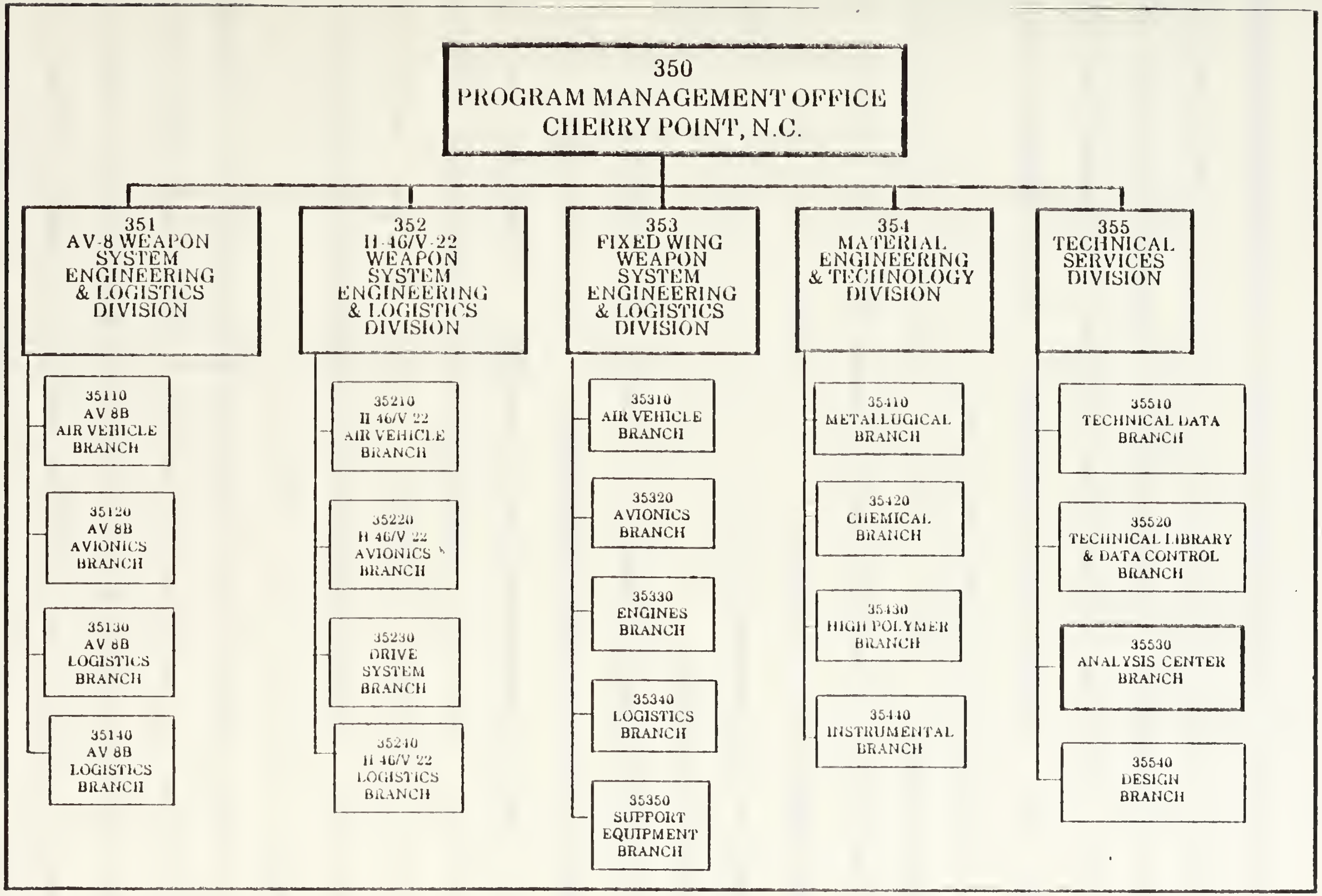

Figure 4-1 Naval Engineering Support Office Cherry Point

recommended changes which will eventually prolong the aircraft systems' longevity, effectiveness and efficiency.

3. Size

Currently, there are nine man years dedicated annually to the center; however, only four man years are directly dedicated to actual data analysis activity. The remaining five man years are devoted to management and support of the analysis function. The analysis center consists of the following personnel:

- Supervisor;
- Aerospace Engineering Technicians (3);
- Mathematician;
- Computer Engineers (2);
- Secretary/Typist;
- Sergeant/Fleet Liaison;
- Opening for Aerotech Engineer.

The aerospace engineering technicians are specialists who have had hands on training with the particular aircraft platform. They do not necessarily possess the formal educational background as that of an engineer.

The position of the mathematician is unique to Cherry Point. In this particular instance, Cherry Point desired to employ a specific individual as an Aerospace Engineering Technician. Unfortunately, this individual did not meet all the criteria required of the aerospace

engineering technician position description. He did, however, have an educational background in mathematics. Thus, the position of mathematician was created and the applicant was hired. He was then trained to perform analysis similar to that of the aerospace engineer technician. In fact, this mathematician is now the resident authority of the C-130/131 aircraft platform. [Ref. 3]

As a matter of convenience to support the chief engineer and his staff, the two computer engineers are positioned in the analysis center. Their primary duties revolve around the maintenance and upkeep of the NESO's computers and all associated equipment. Other than maintenance, they do not deal directly with the analysis function.

The aerotech engineer is a data retrieval clerk. His primary responsibility is accessing and retrieving data from the 3M database system in answer to requests from either analysts or engineers. [Ref. 3]

4. Tasks

The analysis center retrieves information from the 3M database in order to track trends. The two major systems it manipulates in accomplishing this task are NALDA and AMPAS (Appendix B). Although there are other informational inputs which the center utilizes, 80 percent of its data analysis comes from these two sources. The remaining 20 percent come from the Aviation Supply Office (ASO), Safety

Center and the Quality Deficiency Reporting (QDR) Program. The QDR Program provides the NARF's and civilian contractors with a method for reporting deficiencies on new or recently reworked material which may be caused from non-conformance with contract agreements or substandard workmanship [Ref. 4:p. 13-7].

If an engineer has a problem that requires current or historical data on a component or system, the analysis center will support the request in the form of an informal or detailed report. Quarterly reports were once generated, but few people took the time to read them. Consequently, they were eliminated.

The AMPAS system (Appendix B) furnishes canned reports which the analyst can generate. Cherry Point uses AMPAS reports 520, 720, and 733 most often (Appendix C). If the analyst does not wish a canned report format which AMPAS furnishes, he can query the NALDA system. By using its ad hoc queries, the analyst can generate the report to tailor specific requests he receives.

One of the most common queries used is Action Taken Against Malfunction Code by Work Unit Code (WUC). This query generates a list of defective parts within the WUC. Additional queries used are: ranking the sum of Not Mission Capable (NMC) aircraft and Partial Mission Capable (PMC) aircraft by WUC. These queries along with many others

enable the analyst to produce the desired report necessary to answer the request. [Ref. 3]

One of the major functions of the analysis center is the production of the Readiness Improvement Program (RIP) review (Appendix B). A tremendously time-consuming effort, the RIP places an enormous burden on the analysis center during its review. To alleviate this heavy workload, Cherry Point engages contractor support to assist in the collection of data and production of required reports.

5. External Relationships

The analysis center is directly responsible to the Technical Services Division which in turn is responsible to the Chief Engineer. This represents a line authority relationship. The center also generates reports to support requests from the Chief Engineer, engineers conducting investigations, branches within the NESO, and departments within the NARF, such as the Quality Assurance (Q/A) and Weapons Support (WS).

B. NESO JACKSONVILLE, FLORIDA

1. Structure

NESO Jacksonville represents a functional organization structure, departmentalized, into five major engineering divisions (Figure 4-2). It also represents a decentralized structure with the aircraft analysis center branch located in the Weapon Systems Engineering Division.

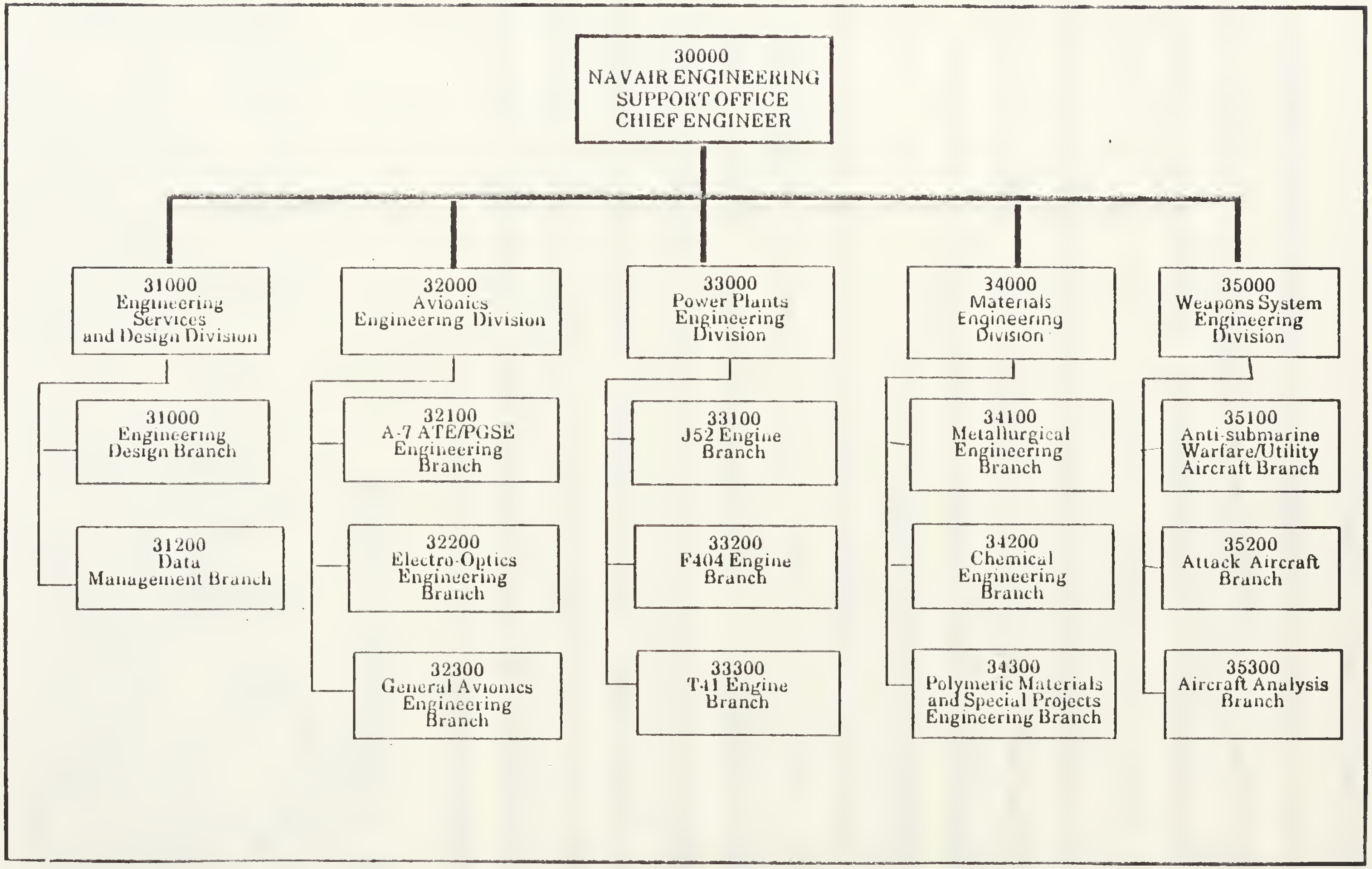

Figure 4-2 Naval Engineering Support Office Jacksonville

The center has been delegated authority to operate as a self-contained unit in support of NESO objectives.

2. Purpose

Verifying and identifying all problem areas which impact the aircraft's mission, capability and readiness is the function of the analysis center. It accomplishes this objective by establishing and maintaining maintenance requirements which affects Reliability Centered Maintenance (RCM). RCM is a logical process that determines necessary maintenance requirements on the aircraft platform and the appropriate schedule for their replacement while maintaining efficiency and productivity.

This analysis center is somewhat unique in that it is concerned only with the aircraft's airframe and avionics, and does not involve itself with the power plants. It is responsible for the A-7 Corsair and P-3 Orion aircraft platforms. However, 95 percent of its analysis is dedicated towards the A-7 Corsair aircraft while the remaining effort is allotted to the P-3 Orion aircraft.

3. Size

Presently there are nine man years dedicated annually to this branch, although only four man years are solely committed towards the analysis effort. The breakdown of the personnel residing within the branch are as follows:

- Supervisor;
- Secretary/typist;

- Engineers (3);
- Aerospace Engineer Technicians (4);
- Opening for an Engineer.

Essentially, both engineers and technicians perform the same task, with the difference being experience and education levels. While the technician possesses the actual hands-on training, based on numerous years of experience, the engineer is the technical expert who answers the specialized questions. The engineers establish maintenance schedules to sustain a particular system, while the analysts are tasked with optimizing the system's performance.

4. <u>Tasks</u>

The analysis center is responsible for Reliability Centered Maintenance (RCM), age exploration, data analysis, Engineering Investigations (EI's), and assistance in the RIP review as necessary. It utilizes numerous different data sources while conducting data and trend analysis. Among these sources are the Aviation Supply Office, Safety Center and the QDR Program. Nevertheless, the two principal systems it employs from the 3M database are NALDA and AMPAS (Appendix B).

Although both systems are used extensively, the analysis center tends to favor the AMPAS system. The most commonly used report which Jacksonville employs is AMPAS 530. It also uses AMPAS reports 520, 540, 591, and 712 to assist in its investigations (Appendix C). AMPAS 725, which

is a quarterly ranking report based on verified failures, is pdated monthly. This report is used personally by the supervisor in determining potential problem areas which may become significant in the aircraft's reliability and maintenance status in the future.

Two major monitoring reports produced at the local level to provide feedback and stimulate investigations, are the A-7 Aircraft Maintenance Condition Report, which is manually accomplished, and the A-7 Aircraft Maintenance Monitoring Report, which is automated.

The A-7 Aircraft Material Condition Report, which is produced every six months, provides information which effects the material condition of the A-7 aircraft revealed by standard depot level maintenance. This report is designed to solicit ideas from the fleet in order to upgrade and improve the aircraft's material condition.

The A-7 Aircraft Maintenance Monitoring Report, which uses 3M data and AMPAS as a source, investigates the performance of systems that fall below established control limits based upon flight hours per verified failures, flight hours per maintenance action, and flight hours per maintenance man hour. This report is built upon matching the WUC's of components and systems with their respective RCM's requirements. It was designed to assist in establishing control limits based on three standard deviations from the mean during a two year baseline period.

The results, if any, will determine if a change in the maintenance or supply system needs improvement. [Ref. 5]

Once the A-7 Aircraft Maintenance Monitoring Report is generated, it is down-loaded from the mainframe computer and loaded on a microcomputer. By using Lotus 1-2-3, graphs and reports are then produced and distributed to the A-7 community. This report, which is a time consuming effort, is produced annually and encompasses a three year time window.

With regard to EI's, Hazardous Material Reports (HMR's), and Explosive Material Reports (EMR's) (Appendix B), the analysis center in Jacksonville has a firmer policy on their control, distribution, and prevailing status. It examines every incoming and outgoing EI that pertains to its platform. With the results of the EI, the analysis center will determine if a larger problem exists and will commence its own investigation if warranted. With regard to the RIP review the center doesn't play an important role, unless specifically requested. RIP has been tasked to the Logistics Department within the NARF [Ref. 5].

5. <u>External Relationships</u>

In the line authority relationship, the analysis center reports to the Weapons Systems Engineering Division, which in turn reports to the Chief Engineer. In addition to supporting the A-7 aircraft community, the analysis center supports its engineers by satisfying their requests for 3M

data. It also supports other branches within the NESO with emphasis on A-7 Attack Aircraft Branch and the Q/A and WS departments within the NARF.

C. NESO NORFOLK, VIRGINIA

1. Structure

NESO Norfolk's organization is representative of departmentalization by system platforms (Figure 4-3). Within the organization there are five major system divisions that create specialized groups performing related activities. The analysis center resides within the Logistics Management Division. As a consequence of departmentalization, work is distributed into manageable size units to take advantage of task specialization in each self-contained branch.

2. Purpose

The analysis center provides maintenance data history to other NESO branches and divisions as well as NAVAIR and the fleet in order to help them plan for future and corrective maintenance actions [Ref. 6]. It also performs system evaluations to determine changes to be incorporated for the improvement of aircraft readiness. The analysis center is responsible for all airframe, avionic, and power plant analysis for the F-14 Tomcat and A-6 Intruder aircraft system platforms.

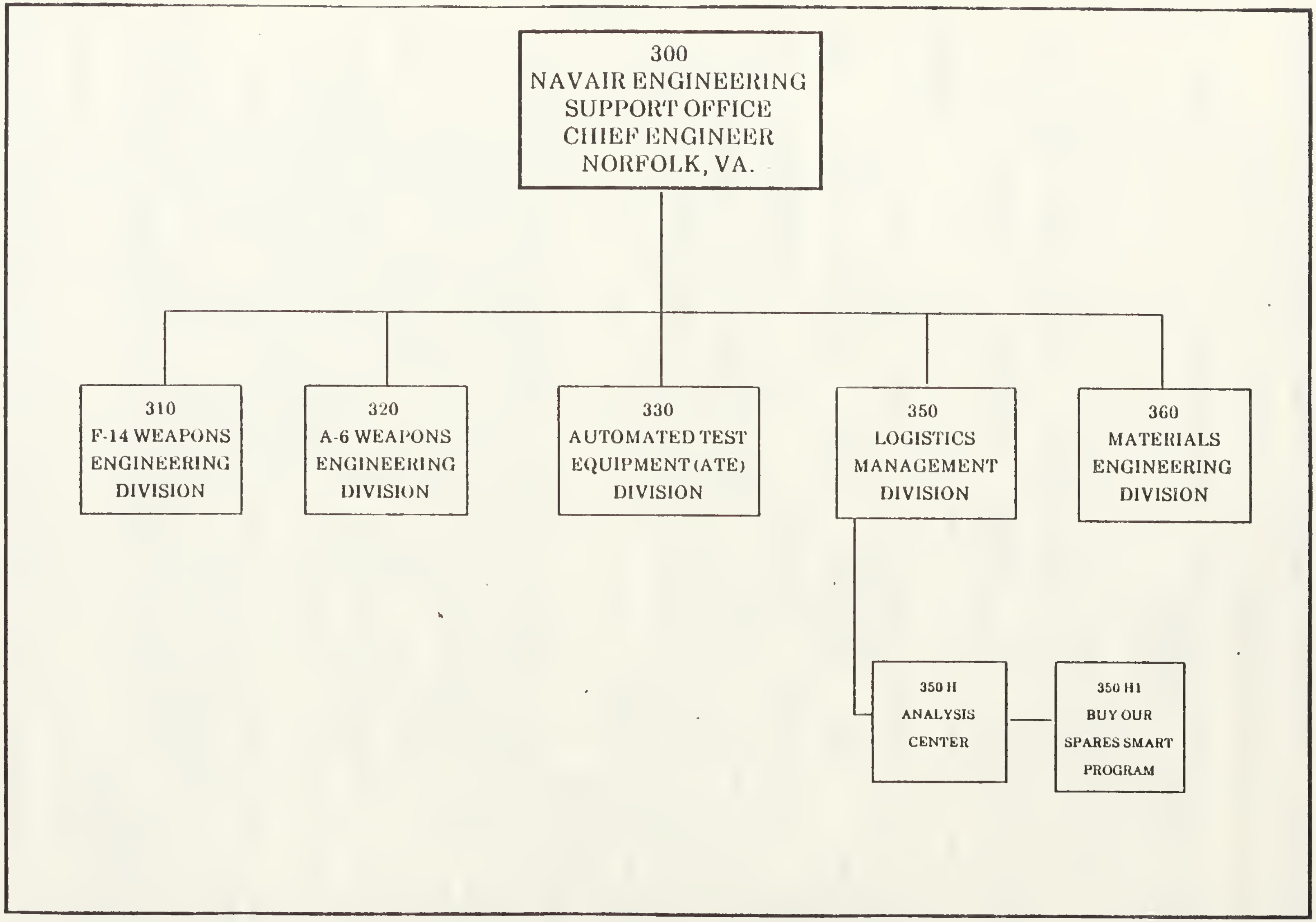

Figure 4-3 Naval Engineering Support Office Norfolk

3. Size

The center maintains a force of ten people whose positions are classified as follows:

- Engineer;
- Aerospace Engineer Technician (3);
- Logistics Manager Specialists (3);
- Military Fleet Liaison (2 E-6's, 1 E-7).

Although ten people are employed in the center, only three man years are directly dedicated to analysis. The engineer is the technical expert who interfaces with other branch engineers to translate problems in lay terms which the analyst can understand. The logistics managers plan and coordinate from inception to disposal the life cycle management policies which effect the support, parts, and repair cycles for that particular aircraft system.

4. Tasks

Once a request is received, the analyst determines which report should be generated to best satisfy the requestor's needs. A typical sequence will have the analyst first using NALDA's ad hoc query system. Using Action Taken Against Malfunction Codes by WUC, the analyst will identify defective components. By further querying the NALDA system, the analyst will begin to isolate the problem area to hopefully reach a solution for that particular request. After exhausting the NALDA system the analyst will turn to the AMPAS system. The most common AMPAS report used

is 720. Additional reports helpful to the analyst are the AMPAS ranking reports, 510-516, which will rank based upon certain parameters (Appendix C). While there are other informational sources, such as the Aviation Supply Center, Safety Center and the QDR Program, the majority of the data analysis comes from the 3M database using both NALDA and AMPAS. The analyst uses the above reports and queries to handle requests and unique reports that occur daily.

Another task of the analysis center is the quarterly production of a local in-house report called the Failure Rate Analysis (FRAN) report. This report is a tool which provides timely and comprehensive identification of aircraft systems, subsystems and components experiencing abnormal failure rates. It increases the analysis center's early detection ability in the identification of high failure rates of specific equipment. Based on an 18-month period, it compares the mean and standard deviation of the most recent 18 months to the current baseline and standard deviation. If a significant difference exits, then the baseline will be re-established using the most recent eighteen month period findings. [Ref. 6]

Another function of the analysis center in Norfolk is a program called Buy Our Spares Smart (BOSS). This program, although not directly related to analysis, plays a significant role in the analysis center's manpower usage. The BOSS program is designed to examine the procurement of

replacement parts at a feasible price to prevent waste, fraud and abuse, and has dedicated to its cause four man years annually.

Finally the analysis center's remaining effort is concerned with the RIP and assistance in producing data analysis for EI's (Appendix B). Due to the time consuming effort the RIP review entails, Norfolk has contractor support to assist it in conducting the data collection required.

5. <u>External Relationships</u>

The analysis center has a line authority relationship with the Logistics Management Division which in turn reports to the Chief Engineer. Roughly 60 percent of the analysis support is in response to the NESO engineers requests for data to assist in their current investigations. The remainder of the effort is directed to assisting production engineers and planners, Q/A and WS departments and the Engineering Officer. Historically, however, it is the NESO engineers who need more analysis.

D. NESO PENSACOLA, FLORIDA

1. <u>Structure</u>

As a consequence of the recent reorganization of NESO Pensacola, the analysis center has been positioned within the Reliability Centered Maintenance (RCM) Branch (Figure 4-4). Also included are the RCM program, commercial contractors, and systems safety. It was determined by the

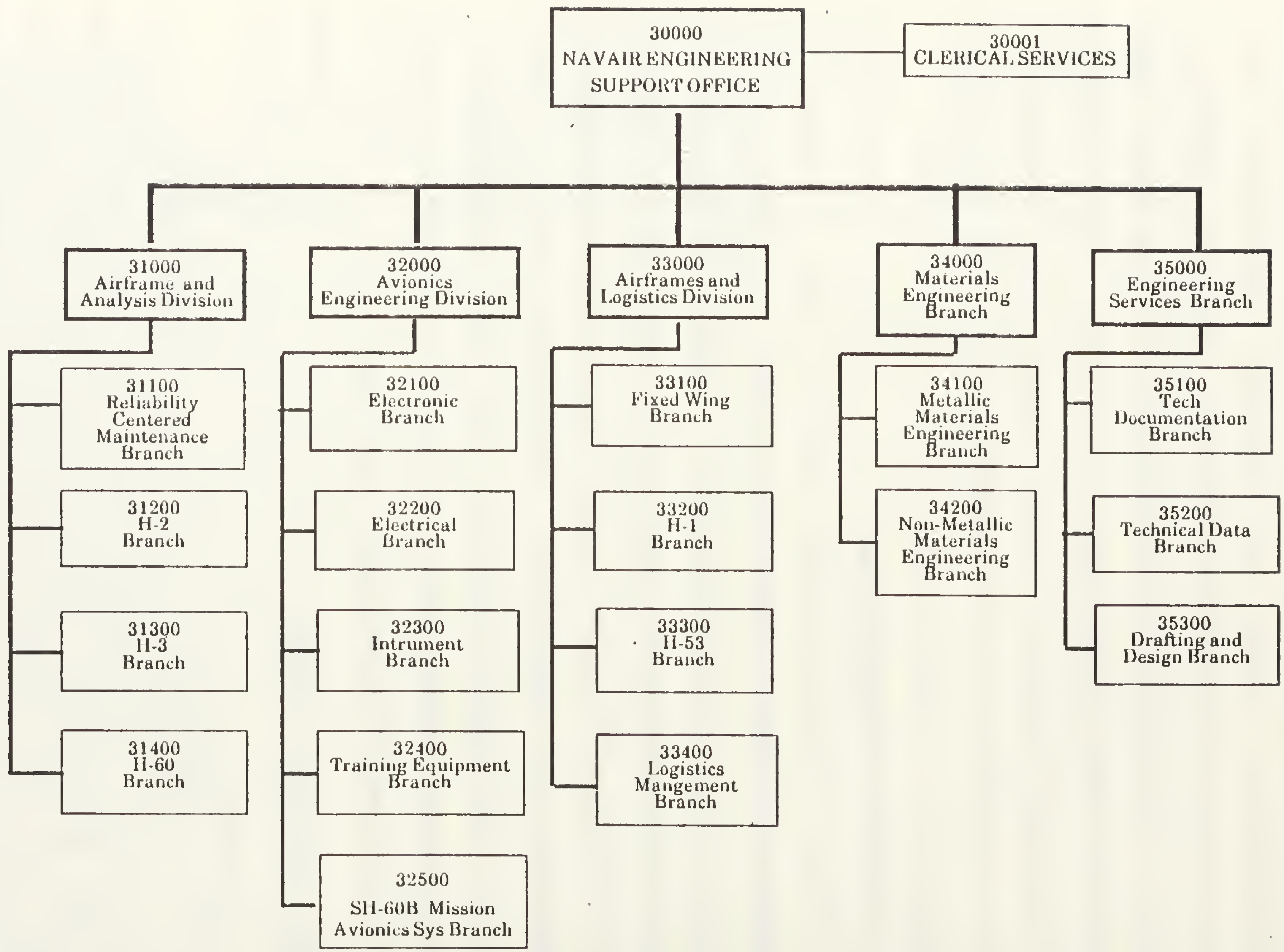

Figure 4-4 Naval Engineering Support Office Pensacola

Chief Engineer that these four areas representing the specialized programs be associated together. The result of this action was the grouping of these specialized programs into one homogenous formation. As a consequence of being decentralized and self-contained, the unit was delegated authority to control all analyses which other branches requested.

2. Purpose

The analysis center provides centralized expert control to access the existing 3M databases. Maintaining its autonomy, the center furnishes services in the form of reports, data analysis dumps, analysts support, programming, telecommunications linkage and personal computer usage for all of its eight aircraft system platforms [Ref. 7]. These include the following aircraft: A-4 Sky Hawk, H-1 Iroquois, H-2 Sea Sprite, H-3 Sea King, H-53 Sea Stallion, H-60 Sea Hawk, T-2 Buckeye and T-34 Mentor. By providing all this support, the goal of the analysis center is to deter potential problem areas from becoming material difficulties.

3. Size

Presently there are five man years dedicated towards the analysis center. It consists of two engineers responsible for all equipment, internal programs, existing hardware and software, and any other data software which will enhance the centers' capability. The three aerospace

engineering technicians are responsible for trend analysis, data retrieval and entry, and summarizing their findings in report format that can be distributed within the division.

4. Tasks

Established as a service support function, the analysis center generally receives its requests from its engineers and RCM analysts. Once a request is received the analysts then determine which 3M system to use either that of NALDA or AMPAS (Appendix B). 80 percent of the information comes from these two sources. The remaining twenty percent come from the Aviation Supply Office, Safety Center and the Quality Deficiency Reporting Program. Due to the sheer size of the extensiveness of some of the reports, the analysts rely upon their judgment and experience to determine which report or reports are generated to tailor the request.

The most common query that the analysts will use in the NALDA system to get the request moving is the Action Taken Against Malfunction Codes by WUC. This simple query will list all the defective components for that WUC. From that point on, it is the experience of the analyst using the NALDA ad hoc query system that determines exactly what information will be accessed for a particular request. While the NALDA system provides on-line real time response, the AMPAS system produces batch mode canned requests. Most frequently used AMPAS reports, which Pensacola assembles

while conducting its analysis, are the 520 and 735 report (Appendix C). Also utilized are the ranking report series which will rank according to the specific parameter desired. These reports are 510-516 (Appendix C). [Ref. 7]

Previously the quarterly reports that were generated manually took upwards to ten days to assemble. However, with the introduction of the AMPAS Report 725 (Appendix C), the quarterly report is now automated and takes only days to formulate with the identical information desired.

In addition to the above mentioned tasks which the analysis center performs, it is also responsible for the RIP review (Appendix B). Currently NESO Pensacola performs eight RIP's per year. Due to the time-consuming effort which is required, the analysis center has contract support. This support comes in the form of 12 man years which is divided equally among the RCM branch.

As a final note, a local in house program called Document Control Form (DCF) is used by the center. Essentially, this computer program is designed to track all external communications and correspondence received and provide an updated report on its status.

5. <u>External Relationships</u>

Within the NESO group a line authority relationship exists with the RCM Branch Supervisor who is responsible for the analysis center. He reports directly to the Airframes and Analysis Division which in turn reports to the Chief

Engineer. Although most of the support and reports produced by the analysis center are within its own NESO organizational branches, it does provide, upon request, reports to the WS department within the NARF, and fleet units who have an interest in that particular weapons platform. With the reorganization that has taken place, the analysis center has become more service oriented to the branches within NESO.

E. AMERICAN AIRLINES, SAN FRANCISCO, CALIFORNIA

Although a structured interview was not possible with Mr. Ron Hensel, Supervisor of the Reliability Maintenance Division of American Airlines, he did comment on the major reports which his division does generate in an effort to detect trends and conduct proactive analysis. His division presently maintains three reliability analysts. Their duties are equivalent to the aerospace engineering technicians within the NESO.

The major monthly summary produced is called the Performance Report. This computer generated report will list all component, engine, and auxiliary power unit removals; delay and cancellations based on either 100 or 1000 departures; and pilot discrepancies reports per 1000 flight hours. This report is then distributed to all managers and directors who affect the reliability of aircraft. [Ref. 8]

Another summary is called the Recon Report which is similar to the FRAN Report produced by NESO Norfolk. This report uses established baselines for each component to alert the analyst that the specified control limits have been exceeded.

As a final point, in reaction to civil aviation's recent catastrophic mishaps, the Reliability Maintenance Division has received increased attention from upper management.

F. SUMMARY

Each analysis center functions as a complete unit, each with its own philosophy on its position within the organization, what type of reports it should generate, and how many man years it should allocate. Referring to the structure of the analysis centers as presented in Figure 4-5, NESO Alameda is the only center that is divisionalized by weapons systems platforms. The remaining analysis centers are departmentalized by functional divisions. The exact location of each analysis center within the NESO organization differs at each NARF. For example, NESO Cherry Point's analysis center resides within the Technical Services Division, NESO Jacksonville's within the Weapons Systems Engineering Division, NESO Norfolk within the Logistics Management Division, and NESO Pensacola within the Airframes and Analysis Division.

Regarding manpower allocation, most analysis centers' range from a low of six individuals, NESO Pensacola, to a

ALAMEDA	CHERRY POINT	JACKSONVILLE	NORFOLK	PENSACOLA	AMERICAN AIRLINES
STRUCTURE					
DIVISIONALIZED BY WEAPON SYSTEM PLATFORM	DEPARTMENTALIZED BY FUNCTIONAL DIVISIONS	DEPARTMENTALIZED BY FUNCTIONAL DIVISIONS	DEPARTMENTALIZED BY FUNCTIONAL DIVISIONS	DEPARTMENTALIZED BY FUNCTIONAL DIVISIONS	STRUCTURE UNKNOWN DUE TO REORGANIZATION
PERSONNEL					
2 AEROSPACE TECHNICIANS	1 SUPERVISOR 3 AEROSPACE TECHNICIANS 1 MATHEMATICIAN 2 COMPUTER ENGINEERS 1 SECRETARY 1 FLEET LIAISON 1 OPENING	1 SUPERVISOR 4 AEROSPACE TECHNICIANS 3 AEROSPACE ENGINEERS 1 SECRETARY 1 OPENING	1 SUPERVISOR 3 AEROSPACE TECHNICIANS 1 AEROSPACE ENGINEER 3 FLEET LIAISON 3 LOGISTICS MANAGERS	1 SUPERVISOR 3 AEROSPACE TECHNICIANS 2 AEROSPACE ENGINEERS	1 SUPERVISOR 3 RELIABILITY MAINTENANCE ANALYSTS
REPORTS					
RIPS	AMPAS 520 720 733 RELIABILITY & MAINTENANCE SUM MAINTENANCE ANALYSIS SUM RIPS	AMPAS 500, 520,530,540 591,712,725 A-7 A/C MAINTENANCE CONDITION RPT A 7 MATERIAL CONDITION RPT	AMPAS 510,511,512,,51313 514,515,516,720 FRAN BOSS RIPS	AMPAS 510,511,512,.51313 514,515,516 720 520,735,725 QTR RPT RIPS DCF	RECON RPT MONTHLY PERFORMANCE RPT

Figure 4-5 Overview

high of 11 individuals, NESO Norfolk. Presently there are two individuals within the S-3 analysis center.

Finally, with reference to reports generated (Figure 4-5), most of the analysis center's, including American Airlines, produce a local in-house report in order to detect trends so that they can become more proactive.

V. CURRENT SITUATION OF NESO ALAMEDA

A. ORGANIZATIONAL STRUCTURE OF THE NESO OFFICE

To fulfill its responsibilities, the NARF Alameda NESO directs the efforts of the following subordinate divisions:

- S-3 Aircraft Weapon System Engineering Division;
- P-3 Aircraft Weapon System Engineering Division;
- Turbine Power and Aircraft Accessories Division;
- Materials Engineering Division;
- A-3 Aircraft and Missiles Engineering Division.

This organizational structure is shown in Figure 5-1.

B. THE WEAPON SYSTEM ENGINEERING DIVISIONS

Only the S-3 and P-3 aircraft are supported by a Weapon Systems Engineering Division at NARF Alameda. Each such division primarily develops the engineering design data either structural or mechanical for redesign, reconfiguration and modification of aircraft under the auspices of the NARF. It also conducts continuous analysis of aircraft weapon systems in order to either establish or revise the depth and scope of particular systems rework requirements. The organizational structure for the S-3 Weapon System Engineering Division is shown in Figure 5-2.

Coordinating the maintenance efforts within NESO and other organizations, it executes, directs and governs the investigation and analysis which produces reports in

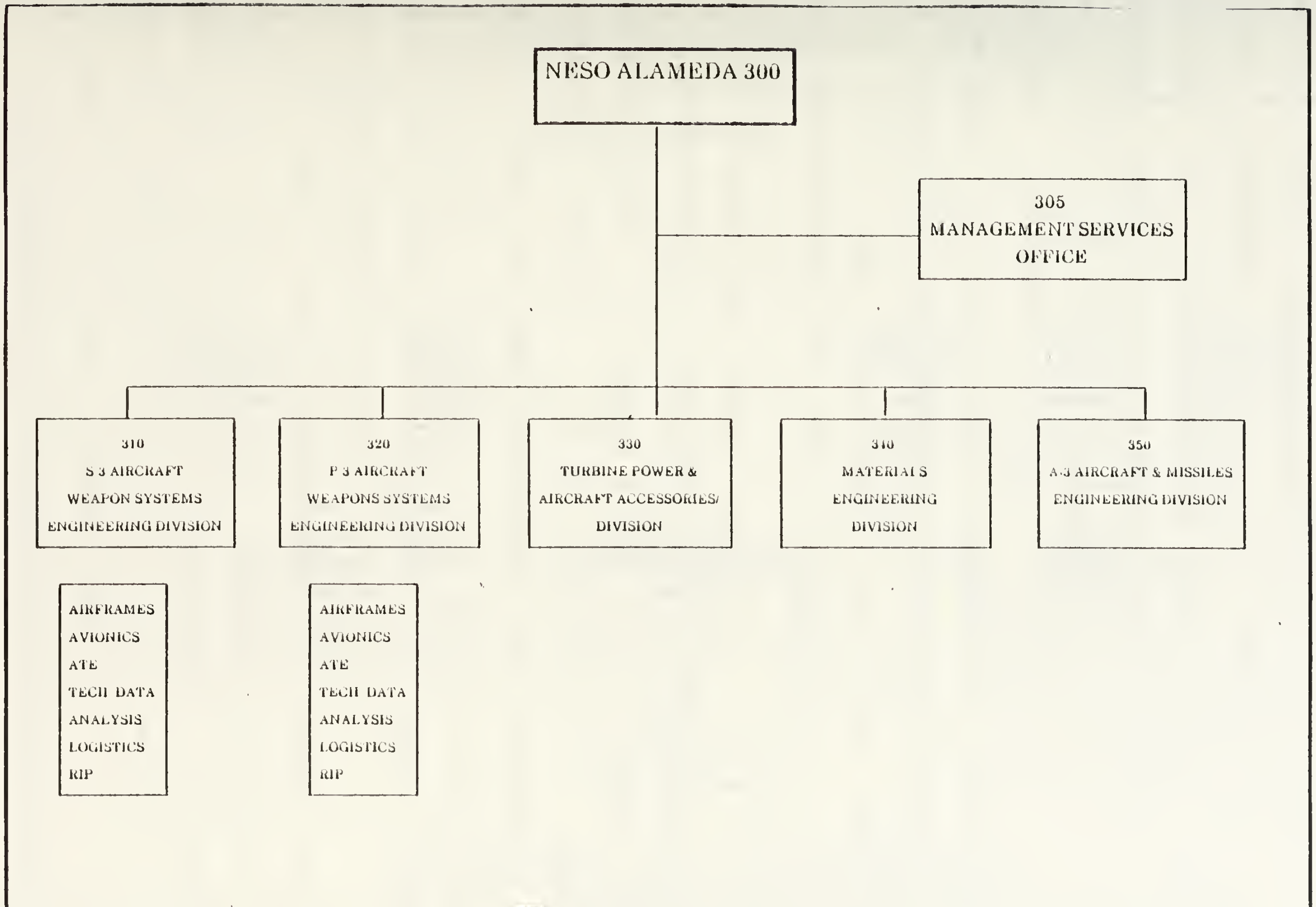

Figure 5-1 Naval Engineering Support Office Alameda

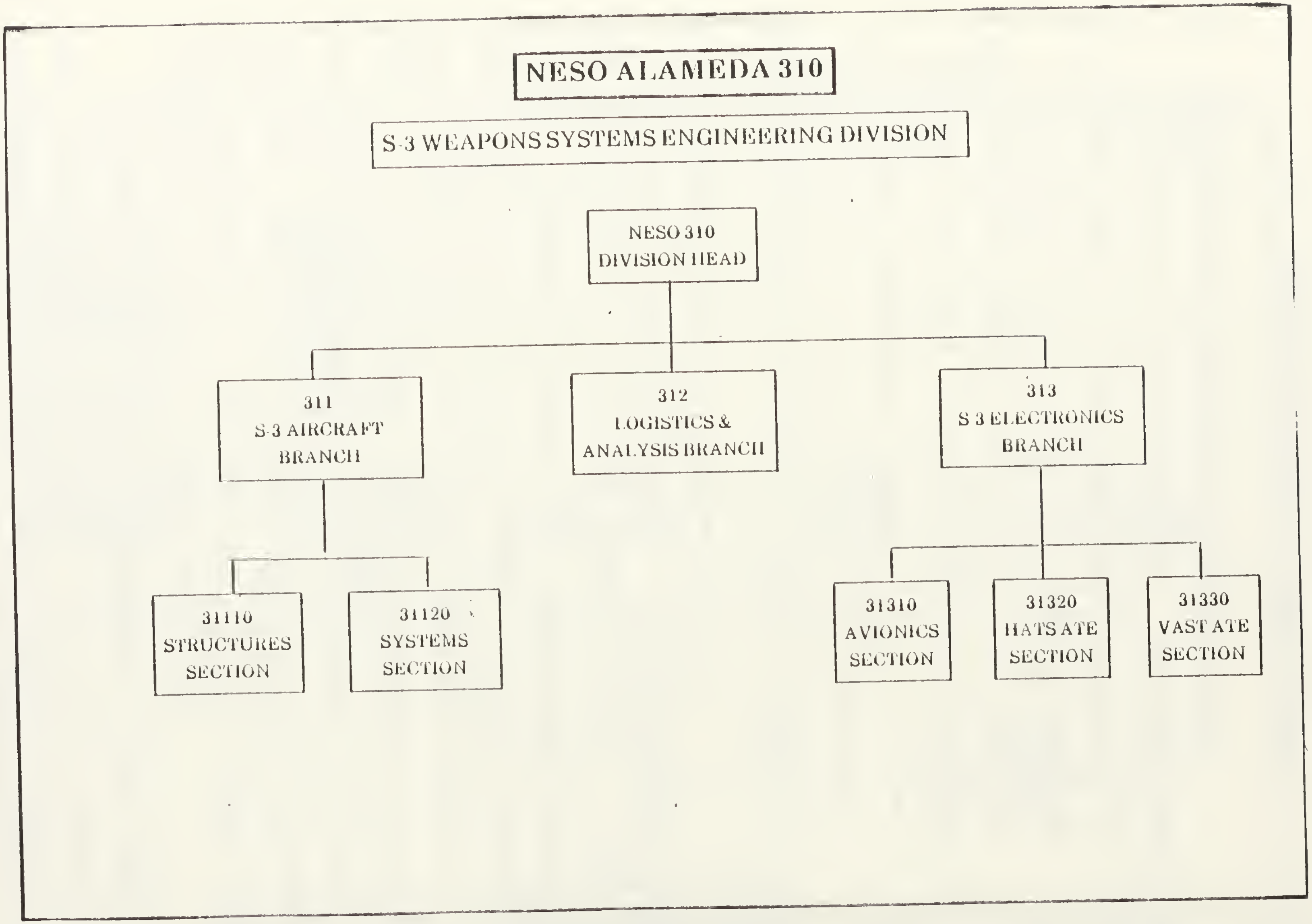

Figure 5-2 S-3 Weapons Systems Engineering Division

response to Engineering Investigation Requests (EI) and Hazard Material Request (HMR'S) and Engineering Material Requests (EMR's) concerning material directly related to the weapon platforms of the aircraft. Moreover, it yields punctual up to date engineering specifications, technical services required for the rework of weapon systems and all associated components and analytical reviews to assure adequate maintenance support. Lastly, it provides consultant services to those organizations which request it, accomplishes those assigned engineering projects it has been tasked with, and organizes maintenance engineering projects within the NESO on an as needed basis.

C. THE LOGISTICS AND ANALYSIS BRANCH

The Logisitics and Analysis Branch, better known as the Analysis Center, is located within the S-3 Weapon System Engineering Division. It is the role of the Analysis Center, using 3M data, to document and investigate the current problems as well as reveal potential problems that impact the reliability, maintenance, and logistic support for the S-3 aircraft.

The center conduct research into maintenance data in order to isolate recurring difficulties which are responsible for reduced aircraft readiness. It identifies specific problem areas with the S-3 and assists in the coordination of corrective action. [Ref. 9]

Presently the analysis center maintains a force of two aerospace engineering technicians. With only two people within the center the aerospace engineering technicians are overloaded with work requests. Currently conducting the RIP review, almost all of the analyst's attention is devoted exclusively to accumulating and interpreting the necessary data required for the program and any substantive data analysis work is foregone.

A line authority relationship does exist. The analysis center reports directly to the Logistics Branch Supervisor, which in turn reports to the S-3 Weapons System Engineering Division Supervisor, who ultimately reports to the NESO Chief Engineer.

D. MAJOR CONCERNS IN AN ORGANIZATIONAL DESIGN FOR THE ANALYSIS CENTER

In assessing the current organizational structure for the analysis center, there were found to be three major areas of concern. These were:

- the assignment and division of routine responsibilities to the appropriate office;
- the ability to deal with unexpected additional tasking;
- the necessity of a user interface with the data center.

Each of these areas of concern will be discussed individually in this chapter.

1. The Assignment and Division of Routine Responsibilities

Division of labor has long been recognized as one of the cornerstones of effective organizational design. The larger tasks or goals on an organization must be decomposed into smaller, more manageable sub-tasks. Each sub-task may often be even further broken down into even smaller sub-tasks. The processes may continue until one reaches an atomic level such that further partitioning is either impossible, unnecessary, or undesirable. An effective organization design is one that not only lends itself to the successful accomplishment of these sub-tasks, but appropriately groups associated sub-tasks together and specifically delineates the responsibilities for their accomplishment to the appropriate members of the organization.

Fundamental to this decomposition of the organization's goal into sub-tasks are the concepts of differentiation and integration. These concepts were developed by Harvard University researchers Paul Lawrence and Jay Lorsch. The cornerstone of the studies of Lawrence and Lorsch is their definition of an organization as

> . . . the coordination of different activities of individual contributors to carry out planned transactions with the environment. The expression 'different activities' in this definition embodies the traditional concept of division of work. . . . If the various individual contributors are going to work in an organization, they will somehow have to divide up the work; . . . 'coordination' is the other half of the division-of-work equation. Without coordination, division

of labor is random--the antithesis of organizations. Organizations must have coordination to accomplish the ends outlined in their central goals. [Ref. 10]

Given this perspective, Lawrence and Lorsch espouse that the key concepts to developing an effective organizational structure are those of differentiation and integration.

These two concepts are directly related. Differentiation is the process of breaking down the larger tasks into the aforementioned sub-tasks, with integration referring to the means by which all the completed sub-tasks are coalesced to then accomplish the ultimate goal of the organization. Both of these processes are of equal importance. As sub-dividing tasks and responsibilities is more efficient than all the members of the organization trying to do the same thing, without effective integration of all these tasks, the effort of this division of labor is for naught.

With respect to the data center, each major task of the organization must be sub-divided into smaller sub-tasks. This is the process of differentiation. These sub-tasks should then be logically grouped together on the basis of some like attribute or similarity and assigned as the responsibility of a specific office of the organization. This grouping together process is one aspect of integration.

The Alameda analysis center simply cannot discharge its responsibilities with a staff of two persons. The differentiation of tasks within the center is a major

determinant of the ultimate staff size. After examining other similar operations and acquiring a well-founded understanding of analysis center operations, tasks can then be logically divided as assigned to the appropriate staff members. With a staff of two, the differentiation of responsibilities is extremely inadequate.

Of equal importance is then the integration of the divided responsibilities to contribute to the overall efficiency and effectiveness of the analysis center. With only two members in the organization, the need for the integrator role doesn't appear overly critical. However, once an organization is designed with an adequate number of staff members, the necessity for integrators is crucial. Hierarchical levels of supervision must be created to manage differentiated responsibilities.

Having grasped the necessity for differentiation and adequate personnel to support this differentiation, one must then be concerned with technological issues. In this case, technology is defined as "the actions that an individual performs upon an object with or without the aid of tools or mechanical devices, in order to make some change in that object." [Ref. 11:p. 195] A broader, yet equally valid definition of "technology is the application of knowledge to perform work." [Ref. 12:p. 531] The development of organizational structures

> . . . reflect technology in the ways that jobs are designed (the division of labor) and grouped

> (departmentalization). In this sense, the current state of knowledge regarding appropriate actions to change an object acts as a constraint on management. [Ref. 13:p. 358]

In organizational design, we must therefore be concerned with how technology impacts differentiation and integration processes and ensure that differentiation and integration based upon technology is given just consideration, but at the same time, is not in conflict with other bases for organizational design.

Once the organization has been designed with attention given to technology, the structure should then be durable. Relatively few changes to the organizational structure should be required solely as a consequence of technology if it has been given adequate concern in the initial design.

Technologically speaking, the analysis center operates within a stable environment [Ref.14:pp. 77-78]. From a macro standpoint, the function of the analysis center is clear and straightforward: the analysis and interpretation of data. Before data can be interpreted, it must be gathered and retrieved. Since gathering the data is not one of the responsibilities of the center, all the processes of the analysis center may be grouped into two general technological areas, those of retrieval and analysis/interpretation.

Given the workload and diverse responsibilities of the S-3 Analysis Center, it is logical to assign the

responsibility of data retrieval to a specific position within the organization. No matter what form these data are in, they must be retrieved before they can be analyzed. Since this technological differentiation of the retrieval and analysis function is not likely to change in the foreseeable future, differentiation based upon these technological distinctions is warranted. As a better understanding of the complexity of analysis center operations is gained, greater differentiation on the basis of technology will be required.

2. <u>The Ability to Deal with Unexpected Additional Tasking</u>

Inability to deal with the unexpected has been the nemesis of many a competent manager. As the number of non-routine events occur that demand the attention of management, the more the managers efforts are devoted to the day-to-day operational details. The consequence is familiar. The manager reverts to crisis management to deal with these exceptional events and sacrifices the long term strategic goals of the organization. Galbraith identifies two means of exception handling that may be designed into the organization: (1) the creation of slack resources and (2) the creation of self-contained units [Ref.15:pp. 87-88].

In the analysis center, as in any service organization, the two primary resources are time and manpower. If the manpower is unavailable to allow deadlines to shift, then excess manpower, designed into the

organization is the alternative. However, the combination of the two is optimal. By having excess human resources and allowing lower priority deadlines to shift, the organization can deal with exceptions readily. It is the role of management to prioritize the deadlines and redirect the human resourcesat their disposal. An effective organization design facilitates this.

> The strategy of using slack resources has its costs. Relaxing budget targets has the obvious cost of requiring more budget. Increasing time to completion date has the effect of delaying the customer. . . . Reduction of design optimization reduces the performance performance of the article being designed. Whether slack resources are used . . . or not depends on the relative cost of the other alternatives. [Ref. 15:p. 88]

The second alternative is to create self-contained units. Each unit is given all the resources, to include personnel, to supply the output required. One major advantage of the self-contained unit is all the energies of the unit are directed toward the achievement of a single specific task. It is a reorientation from functional groups toward product groups (be that product a tangible one or a service).

"The cost of the self-containment strategy is the loss of resource specialization." [Ref. 15:p. 89] Budgetary considerations may prevent each self-contained unit from have the benefits of a specialist assigned to the individual unit whereas the larger functional organization could better justify the expense of retaining such expertise.

The S-3 analysis center obviously has no slack resources. With only two persons, it cannot adequately respond to the routine demands for raw or processed data. Any new request for output from the center results in the delay or cancellation of prior requests entirely.

While many data requirements are recurring, relatively constant, and to a large extent can be anticipated and planned for, most are erratic and unpredictable. Aircraft parts and components do not fail at a constant rate. The tempo of fleet operations can deplete stocks of necessary consumable aviation supplies. A change in standardized airborne operating procedure or technique may have an unanticipated consequence on aircraft maintainability. Even the weather has its impact. Operation in the extremes of heat and cold may hasten failure or otherwise effect the proper operation of a critical part or component. The list is endless. All of these circumstances impact fleet readiness. The responsibility for supplying the necessary data to identify a problem and seek its solution fully lies with the analysis center. Clearly, additional manning, with slack personnel resources included is necessary.

The ability to create self-contained units is one that is not available in the S-3 analysis center. Formation of a task force or project team is an ideal way to deal with both recurring and unexpected problems, such as those

mentioned in the preceeding paragraph. Not only must the center have diverse and varied expertise, it must have this in adequate numbers such that the overall production effort of the center does not suffer as a consequence of the creation of this type of contingency group.

E. USER INTERFACE WITH THE DATA CENTER

In designing the organizational structure for the analysis center, we are reminded that our concern is with a management information system. With this in mind, we note that:

> Users are perhaps the most important of all categories of MIS personnel. And users are MIS personnel, even though most would not consider themselves as such. . . . The MIS director who views users as external to the system is on the road to failure. [Ref. 16:p. 126]

By acknowledging this, we are then compelled to include the users in the organizational design. It must be remembered that the ultimate users of the analysis center are those who fly and maintain the aircraft in the fleet. However, there is no such contact with these users by the S-3 Analysis Center. In fact, most of these users are unaware of even the existence of the center. Two way communication with these users is vital to ensure the center is responsive to their needs.

While the fleet is the ultimate user of the analysis center, there are others that must be reckoned with. One other user group that warrants specific attention are the aerospace engineers of the rework facility. These

individuals make the most direct and day-to-day use of the center's facilities. Again, there is no mechanism for effective interface with this group. This too is an essential element to be considered in designing the organizational structure.

VI. RECOMMENDATIONS

A. STRUCTURE

An independent Analysis Center Division should be created. Combining the existing analysis centers from both S-3 and P-3 Aircraft Weapon Systems Engineering Divisions will result in better resource utilization by NESO Alameda (Figure 6-1). A single, consolidated analysis center will alleviate a number of manpower constraints simply by eliminating unecessary duplication in parallel organizations. Centralization of the entire analysis effort will result in greater control of the operation yielding a more uniform, quality analysis product. Departmentalized within the NESO, the analysis center should operate as a decentralized self-contained unit delegating the necessary authority and control required to satisfy its requests from other divisions. A line authority relationship should exist in which the analysis center supervisor reports directly to the NESO Chief Engineer.

Within the analysis center, the supervisor should have the responsibility of coordination, control, and management of the functions associated with conducting analysis (Figure 6-2). By delegating the necessary authority to the supervisor, he is now responsible and accountable for all duties performed within his division. Directly under his

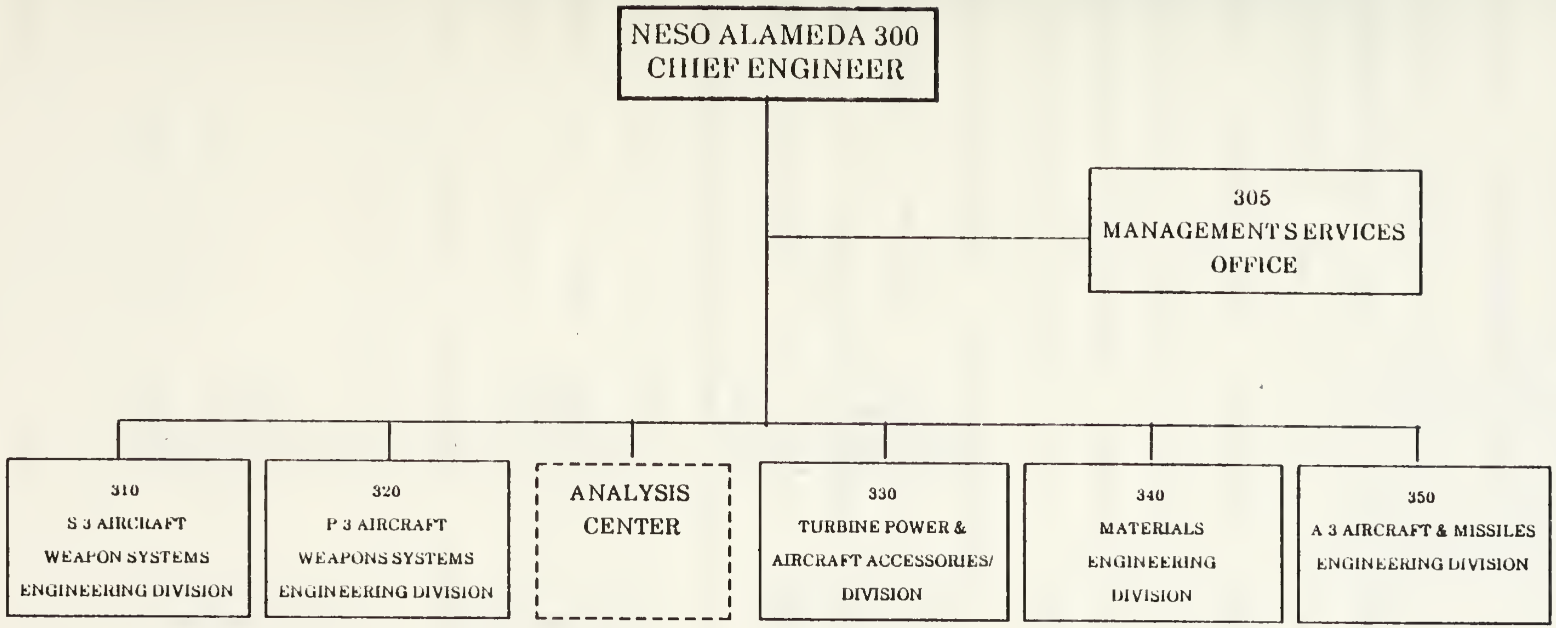

Figure 6-1 Proposed Naval Engineering Support Office Alameda

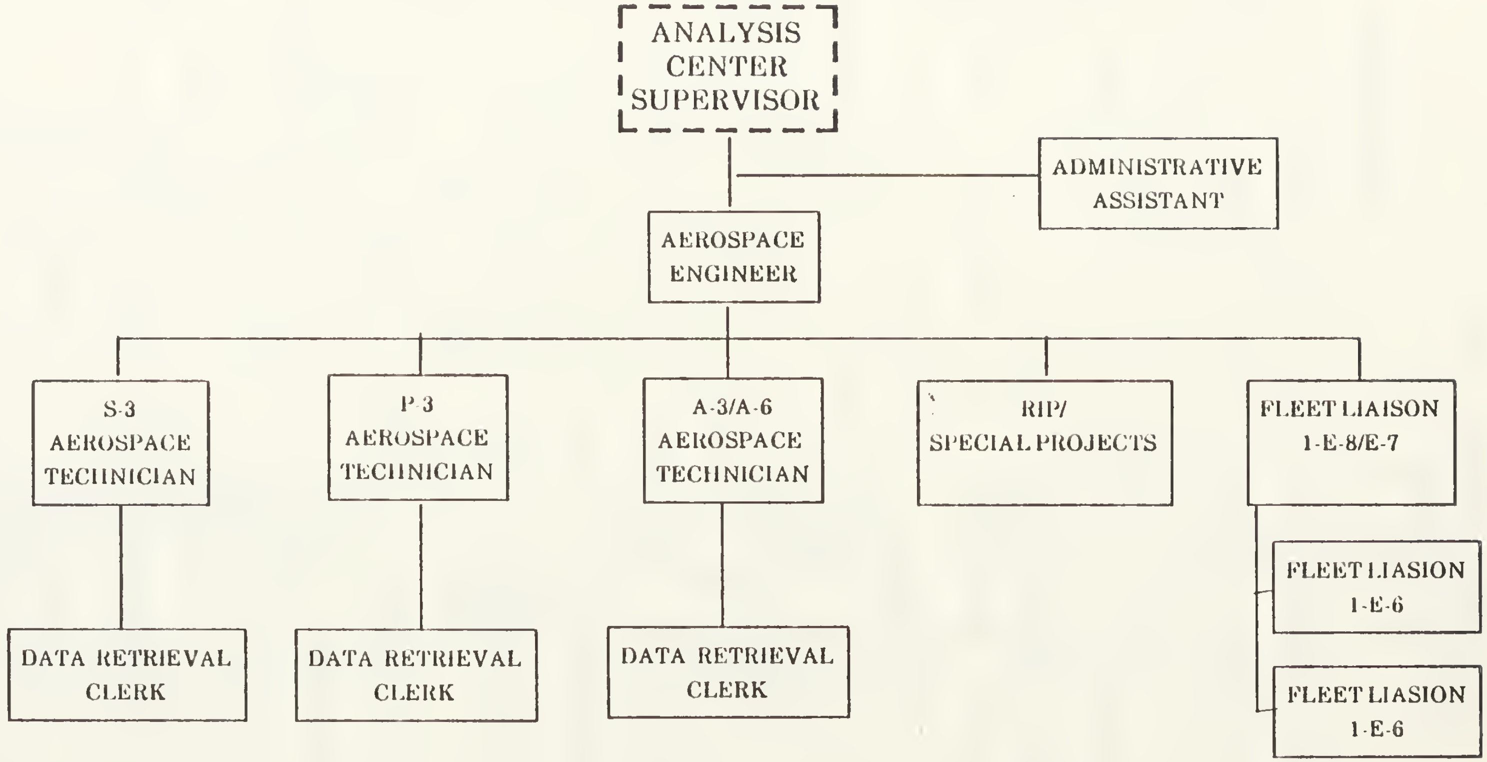

Figure 6-2 Proposed Analysis Center Alameda

control is the aerospace engineer. The engineer will serve as the executive officer to the supervisor. He will function as the acting supervisor when the supervisor is not available. His primary role is to serve as the interface on technical matters between the analysis center and the engineers within the NESO organization.

Descending the hierarchy, the next level in the analysis center organization contains the aerospace engineering technicians, RIP/special projects, and fleet liaison. All positions on this level represent specialized staff members who are directly responsible to the supervisor. By creating this arrangement, the supervisor transfers to his staff specialists certain functional authority granting them latitude in decision making concerning their specific aircraft platforms [Ref 17:p. 222]. Consequently, each aerospace engineering technician is the resident expert and point of contact for his aircraft platform. He has at his disposal is a data retrieval clerk to access the 3M database. Finally, the administrative assistant fulfills the staff function providing assistance and support to the supervisor and personnel within the analysis center.

B. SIZE

In order for the analysis center to access databases, provide weapon system support, and execute data analysis, it must be allocated sufficient manpower. Without adequate personnel, the analysis center will be occupied entirely by

its reactive responsibilities and be forced to forsake its proactive data analysis.

An efficient and effective analysis center for NARF Alameda is comprised of the following personnel:

- 1 Supervisor;
- 1 Administrative Assistant;
- 1 Engineer;
- 3 Aerospace Technicians;
- 3 Data Retrieval Clerks;
- 3 Fleet Liaisons;
- 1 Special Project.

1. Supervisor

Responsible for acquiring, processing and using information sources effectively, this individual plays a very important role in helping the organization attain its mission and goals [Ref. 18:p. 122]. Although the supervisor does not need to be trained as a specialist or technician, he must have both the education and perspective of a manager. Additionally, he should possess some experience from on-the-job training. As the senior member of the analysis center and responsible for its integration within the NESO organization, the supervisor must have a complete and thorough understanding of its operation and its interfaces external to the division. The supervisor is ultimately responsible with the performance of his division. It is his job to plan, organize, direct, and control the

functions of his personnel in order to accomplish the assigned goals of the division.

2. Administrative Assistant

This individual plays an important role in coordinating, sorting and distributing all incoming communications and correspondence for the center. Additionally, a major responsibility of the Administrative Assistant is in-house record keeping. This encompasses logging message traffic, typing correspondence, scheduling appointments, maintaining a tickler file of action items, and revising the centers' publications to conform with Navy directives. The execution of these responsibilities enhances smooth operation of the division and enables the center to better keep in touch necessary contacts external to the division.

3. Engineer

Qualified educationally in his field of expertise, the engineer serves as the resident expert on all technical problems requiring specialized skill and knowledge. He will assist and cooperate with the analyst by interchanging information and experience to unravel any technical questions which is beyond the analyst's level of expertise. Moreover, the engineer serves as the critical interface between the analysis center and the Weapon System Division engineers. Acting as a conduit to the division for all

technical matters, he serves to translate these matters into layman's terms for the division personnel.

4. Aerospace Engineering Technician

The analyst should provide reports, data analysis runs, and analysis support to those personnel requiring access into the 3M database. Although he does not need to possess the academic credentials of a professional engineer, his specialized training should provide the necessary knowledge to identify and isolate problems where those unfamiliar with the aircraft system cannot. Lastly, the analyst serves to assist the engineer in determining which database to use and the nature of the information to be extracted applicable to the problem at hand.

5. Data Retrieval Clerk

This clerk is a terminal operator who is trained using NALDA, AMPAS and other 3M database systems. This individual should be responsible for querying the 3M database to retrieve those data requests that the analysts and engineers require in the conduct of investigations. It is imperative that the clerk receive formal NALDA training at the designated school. Additional extensive training in the fundamentals of the Naval Aviation Maintenance Program is considered essential.

6. Fleet Liaison

Experienced military personnel within the analysis centerare essential to furnish the necessary interface

between the center and the fleet. Expertise and experience from the organizational level are a tremendous asset for interpreting data from the fleet. Three personnel are required for this function, with the most senior being an E-7 or E-8 and the most junior an E-6. As a military liaison, these personnel will have the ability to gain access to information directly from the fleet.

Experienced service members will have greater ease in gaining the confidence of members of the organizational maintenance activities. This confidence lends itself to frank, informal discussions of problems encountered by the organizational level maintenance activity that would otherwise not take place. This will significantly facilitate the information flow from these activities and provide a perspective on problem areas previously unknown to the analysis center. To accomplish these tasks requires a near continuous presence of at least one fleet liaison member in the field. Consequently, three personnel are devoted to this function.

7. Special Projects Manager

Numerous special projects are assigned to the analysis center for completion. In additon to routine EI, HMR, EMR and relatedresponsibilities, countless other offices within the Depot Level Organization are demanding data of various types in order that they may fulfill their responsibilities. Naturally, these data requests find their

way to the analysis center. If others are not to be distracted from their ongoing responsibilities, a specific office must be created to deal with these requests. A RIP/Special Projects Manager will do just that. The special project manager must have a clear and concise understanding of the nature of the problem which is given to him by the supervisor [Ref. 19:p. 4-47]. He will serve and function as the leader from inception to termination producing the proper documentation and reports required. One major responsibility assigned to this office is that of the RIP review.

C. TASKS

In order for the analysis center to perform its mission properly it must produce reports. The analysis center takes information from the 3M database to track trends. To do so, both the NALDA and AMPAS systems must be used. Typical reports which should be used in assisting the analysts to conduct trend analysis are the AMPAS ranking program reports (Appendix B), numbers 510, 512, 513; AMPAS 591 which computes verified failures on equipment; and AMPAS 725, a quarterly ranking report.

D. SUMMARY

In addition to fulfilling requests for information as required, implementation of such a structure for the analysis center of NARF Alameda will permit it to operate

proactively in performing data analysis. The inclusion of slack resources and the organizational structure to deal with unprogrammed or additional tasking will greatly enhance the operation of the center. The incorporation of a fleet liaison capability will a new insight into the analysis function.

It is not within the scope of this thesis to conduct a budgetary review to provide documentation on economic feasibility to justify the analysis centers' manpower requirements. However, prior to the reorganization in August 1984, the analysis center was budgeted for 16 man years annually. With this figure it is not unrealistic to assume that our recommendation of 13 man years are appropriate.

APPENDIX A

STRUCTURED INTERVIEW

1. What is the present organizational structure?

2. How many people are there presently in the analysis center and what are their jobs?

3. How many MAN-YEARS are allocated to the center?

4. If it doesn't match: Why the difference and Why haven't you obtained more?

5. What is your definition of the purpose of the analysis center?

6. How well are you fulfilling the objective?

7. What in your opinion needs to be accomplished to make it better? (i.e., What needs improvement?)

8. The analysis center takes information from numerous different sources. What are they?

9. Basically the analysis center is your problem sorter. What does this mean?

10. How does the analysis center produce reports? What methods does it employ?

11. Who does the analysis center supply these reports to and for what purpose?

12. In reference to the organization who is the analysis center directly responsible to?

13. What networks does the analysis center interface with in the organization and for what purpose?

14. What is the daily routine of the analyst in the center?

15. What does the analysis center do to become more proactive?

16. In your opinion how is the analysis center doing?

APPENDIX B

MAINTENANCE PROGRAMS

As organizations "must effectively receive, process and act on information to achieve performance . . . information enables the organization to respond to market, technology and resource changes." [Ref. 20:p. 40]

With a dynamic environment such as Naval Aviation, it is therefore imperative that the analyst in the organization have available that timely and accurate data to accommodate its needs.

The following programs consequently provide the analyst with the information necessary to make the essential recommendations needed in order to increase their flexibility and level of performance. [Ref. 20:p. 37]

1. ANALYTICAL MAINTENANCE PROGRAM (AMP)

The Analytical Maintenance Program provides the NESO systematic procedures to analyze schedule and corrective maintenance requirements for each type/model aircraft, justify every maintenance requirement and procedure, and enforce compliance of only justified maintenance actions. Additionally, AMP serves as the primary authority for the technical legality on systematic engineering analysis necessary to implement and sustain all feasible,

progressive, and cost effective improvements in the NAMP. [Ref. 21:p. 4-2]

2. ANALYTICAL MAINTENANCE PROGRAM ANALYSIS SUPPORT SYSTEM (AMPAS)

AMPAS was incorporated to execute and endure the phased maintenance program. Utilized for maintenance history and trend evaluations of components and systems under NAMP, it developed into one of the fundamental databases for furnishing analysis procedures and techniques required by NESO engineers and analysts. AMPAS facilitates the analyst to administer the following tasks: [Ref. 21:p. 3-2]

- Analyzing maintenance requirements of each Model aircraft;
- Justifying scheduled and unscheduled maintenance performance;
- Enforcing the performance of only warranted maintenance actions scheduled and prohibiting unnecessary actions;
- Identifying and isolating equipment problems which influence fleet awareness and maintenance resources;
- Suggesting solutions to equipment problems.

With the AMPAS program in effect, the analysis center analyst can access life cycle information up to five years on any component desired. This information greatly enhances the analyst to resolve problems which fleet squadrons are experiencing and make proper assessments to their corrective preventative solutions.

3. NAVAL AVIATION LOGISTICS DATA ANALYSIS (NALDA)

NALDA is an Integrated Logistics Support (ILS) data analysis system. Being an ILS system, it was designed specifically not to impose any more additional data report burdens on fleet organizational units. Its origin was conceived by the requirement that logistic support to various aviation communities was needed on a daily basis to make crucial decisions that determined the capability of the fleet to maintain and operate its air squadrons.

NALDA's objective is "to provide a significantly improved logistics data analysis capability to support NAVAL AIR SYSTEMS COMMAND (NAVAIR) headquarters and fleet type commanders involved in the analysis and management of logistics and engineering." [Ref. 22:p. 1]

NALDA accomplishes this goal by furnishing NAVAIR's advance database to support NAVAIR logistics MANAGEMENT INFORMATION SYSTEMS (MIS), user data analysis programs, and interactive query requirements. NALDA integrates the urgency of data analysis systems in order that all elements of the logistics network be tied together as one closely knit interdependent group. Furthermore, it provides ILS managers with interactive data analysis techniques and tools needed to make decisions based on all relevant logistics information. [Ref. 22:p. 1]

Instead of being fragmented throughout different locations, NALDA's integrated corporate data bank supports

all of the previous applications but at a centrally located site. The resulting benefits achieved were the following:

- Reduced redundancy;
- No overlapped development efforts;
- Insured data consistency and standardization;
- Ease of use;
- New application that were not previously possible;
- Single computer system utilization.

With these improved benefits incorporated into one central database, it became possible for the analyst to perform interactive dialogue with the computer to answer any problems. Moreover, with the ease of use that the NALDA system claimed, it became possible for the analyst not only to ask questions and generate immediate solutions but to execute it in a real time environment, thus reducing time to solve logistics problems critical to the fleet.

4. ENGINEERING INVESTIGATION (EI) PROGRAM

As part of the Naval Aviation Maintenance Discrepancy Reporting Program (NAMDRP), the Engineering Investigation (EI) program produces an investigation process to determine the cause and depth of fleet reported material. Also it supports material associated with aircraft mishaps, lightning strikes, and discharges engineering assistance which relate to fleet material problems. [Ref. 11: p. 13-4] Responsible for the proper execution and administration of the EI program is the NESO, specifically the analysis

center. It is the analysis center which will document the receipt of all EI's and then distribute them to the proper divisions for subsequent investigations.

Upon receipt of an EI from an organizational fleet unit either due to unsafe conditions, aircraft mishap investigations, or directed by higher authority, the screening authority, which is the NESO group, has five working days to respond to the routine request. Once accepted as a viable failure, the EI is assigned an investigation control number. Also provided are shipping instructions for the failed component. Receiving the actual part and depending upon the severity of the request, the NESO group will have anywhere between 10-30 days to respond with its final report.

Whether or not an EI is deemed appropriate, the screening authority will still send a message to the originator citing no investigation required.

EI's play an important role in the tasks of the analysis center. They serve to stimulate the center on the current problems which are happening in the fleet. Once a repeated request is received, it serves as a "red light" to the analyst to start acquiring further detailed information into the problem to avoid catastrophic results.

5. HAZARDOUS MATERIAL REPORT (HMR) PROGRAM

As part of the NAMDRP, the HMR program furnishes a standardized system for reporting material discrepancies

which may result in death or serious injury to personnel, or damage or loss of aircraft and equipment. Other criteria, which may warrant the use of an HMR, would be a situation where the design of a part would be installed incorrectly resulting in system failure, or the loss of an aircraft part while conducting on-ground or in-flight operations. [Ref 11: p. 13-2]

Upon discovery of a potential hazard, the reporting authority has twenty four hours to submit the priority precedence message to its Cognizant Field Activity (CFA) for action.

6. EXPLOSIVE MISHAP REPORT (EMR) PROGRAM

Providing a standardized system, the EMR program defines explosive incidents, malfunctions, and dangerous defects involving launch devices, explosive systems, and Armament Weapons Support Equipment which may lead to serious injury or death to personnel, or loss of aircraft [Ref. 11, p. 13-4].

Besides malfunctions or failures of an explosive system due to failed material, an EMR is also used to change safety instructions for handing ordinance loading or launch device equipment.

As with a HMR an EMR is also submitted by priority precedence message within 24 hours of discovery to its appropriate CFA.

7. READINESS IMPROVEMENT PROGRAM (RIP)

Under the cognizance of NAVAIR and Naval Supply Systems Command (NAVSUP) and with direct participation from the Aviation Supply Office (ASO), the Readiness Improvement Program (RIP) was establish to amplify the operational readiness of all Naval aircraft. The RIP, which is a time consuming manpower effort, starts with data collection and ends with tracking those actions recommended by its analysis. Key elements involved in the RIP process are data and knowledgeable personnel. Through the RIP all logistics support elements which include training, reliability, publications, spare parts, etc., can be viewed and corrective action be taken to resolve problems. [Ref. 21:p. 4-13]

This provides systematic data analysis tracking, and solutions to weapon system equipment problems which will have an affect on the aircraft readiness. In this process the NALDA database is used to assemble the relevant 3-M data for investigation.

By far the most significant meeting is the RIP review. It serves to categorize readiness degradations and corrective actions which adversely affect aircraft mission capability. The reviews added importance is amplified from the viewpoint that fleet participation can further strengthen a weapon systems logistic posture. It is the presence of these experts who possess the experience and

expertise from operational organizations that influences better understanding of fleet problems and provide helpful solutions to avoid them from transpiring.

Although the RIP review identifies typically the top 25 components which cause the most problems fleet wide, it is not the purpose of the review to buy more parts for the sake of buying them to conceal inefficiencies that the fleet might be experiencing. On the contrary, the RIP process encourages communications between maintenance and supply personnel in order that real problems be identified and solutions which are recommended tracked. Finally the RIP process can be said to "improve operational readiness of the aircraft or weapon system being reviewed." [Ref. 21:p. 4-14]

APPENDIX C

AMPAS

REPORT NUMBER	REPORT NAME
510	Ranking Program (WUC by Maintenance Man-hours [MMHRS])
511	Ranking Program (WUC by Elapsed Maintenance Time [EMT])
512	Ranking Program (WUC by MAINT ACTIONS)
513	Ranking Program (WUC by ABORTED FLIGHTS)
514	Ranking Program (WUC by AVG UNIT SHORTS)
515	Ranking Program (WUC by Not Mission Capable [NMC])
516	Ranking Program (WUC Partial Mission Capable [PMC])
520	Individual Maintenance Action Records
530	Detailed Maintenance Action Record
540	Failed Parts Report
591	Verified Failure/Non-Failure Analysis Squadron Summary (for Part Number)
712	Flight Activity, Inventory & Readiness Report
720	Impact Profile System to component (weighted)
725	Quarterly Ranking Report
733	WUC Reliability/Maintainability Analysis
735	Maintenance Suitability Analysis

REPORT DESCRIPTIONS

a. Report 510--Ranking program output isolates and identifies equipment problems defined in terms of maintenance man hours, subdivided into contributions at the organizational, intermediate and depot levels of maintenance.

b. Report 511--Ranking program output isolates and identifies equipment problems defined in terms of total elapsed maintenance time and elapsed maintenance time per maintenance action, subdivided by contributions at the organizational and intermediate levels of maintenance.

c. Report 512--Ranking program output isolates and identifies equipment defined in terms of total maintenance actions, verified failures, sub-component actions and depot level actions.

d. Report 513--Ranking program output isolates and identifies equipment problems in terms of aborted flights.

e. Report 514--Ranking program output isolates and identifies equipment problems defined in terms of average units short.

f. Report 515--Ranking program output isolates and identifies equipment problems defined in terms not mission capable.

g. Report 516--Ranking program output isolates and identifies equipment problems defined in terms partial mission capable.

h. Report 520--Provides raw data dumps of maintenance actions for detailed analysis, research into the interrelationship of problem categories, and improved problem isolation/definition.

i. Report 530--Provides raw data dumps of maintenance actions for detailed analysis, research into the interrelationships of problem categories, and for improved isolation/definition.

j. Report 540--Provides a general overview of failed parts data.

k. Report 591--This program computes the verified failures on an equipment to assist the analyst in determining if a problem area is due to:

(a) Operational reliability;

(b) Training/Troubleshooting;

(c) Supply Support.

l. Report 720--This report assigns a weighing factor to components.

m. Report 725--Quarterly report based on meantime between verified failures, maintenance actions between verified failures and maintenance man hours per flight hour.

n. Report 735--Provides maintenance between failures, maintenance action between verified failures and maintenance manhours per flight hour.

Source: [Ref. 21:p. 3-3]

APPENDIX D

LIST OF ACRONYMS

AMP	Analytical Maintenance Program
AMPAS	Analytical Maintenance Program Analysis Support
ASO	Aviation Supply Office
ATE	Automatic Test Equipment
CFA	Cognizant Field Activity
CNO	Chief of Naval Operations
D	Depot Level Maintenance
EI	Engineering Investigations
EMR	Explosive Material Report
FRAN	Failure Rate Analysis
HMR	Hazardous Material Report
ILS	Integrated Logistic Support
MIS	Management Information System
MMM (3-M)	Maintenance and Material Management System
MRC	Maintenance Requirement Card
NALDA	Naval Aviation Logistics Data Analysis
NAMDRP	Naval Aviation Maintenance Discrepancy Program
NAMP	Naval Aviation Maintenance Program
NARF	Naval Air Rework Facility
NAVAIR	Naval Air Systems Command
NAVSUP	Naval Supply Systems Command

NESO	Naval Engineering Support Office
NMC	Not Mission Capable
OPNAVINST	Office of the Chief of Naval Operation
PMC	Partial Mission Capable
QA	Quality Assurance
QDR	Quality Deficiency Report
RCM	Reliability Centered Maintenance
RIP	Reliability Improvement Program
WUC	Work Unit Code

LIST OF REFERENCES

1. OPNAVINST 4790.2D, "The Naval Aviation Maintenance Program (NAMP)," v. 1, 02 June 1986.

2. Terry, R. G., Principles of Management, 6th ed., Richard D. Irwin, Inc., 1972.

3. Guerry, Peter, Aerospace Engineer Technician, NESO Cherry Point, N.C., Interview, July 23, 1987.

4. OPNAVINST 4790-2D, "The Naval Aviation Maintenance Program (NAMP)," v. 4, 02 June 1986.

5. Hoffman, Daryl, Aircraft Analysis Branch Head, NESO Jacksonville, Florida, Interview, July 22, 1987.

6. Johnson, John, Analysis Branch Head, NESO Norfolk, Virginia, Interview, July 2, 1987.

7. Matzer, Joe, Supervisory Aerospace Engineer, NESO Pensacola, Florida, Interview, July 23, 1987.

8. Hensel, Ron, Supervisor of Reliability Maintenance, American Airlines, San Francisco, California, 10 August 1987.

9. Johnson, Frank, Analysis Center Supervisor, NESO Alameda, California, Interview, June 16, 1987.

10. Lawrence, P. and Lorsch, J., Developing Organizations: Diagnosis and Action, Addison-Wesley Publishing Co., 1969.

11. Perrow, C., "A Framework for the Comparative Analysis of Organization," American Sociological Review, April, 1967.

12. Rousseau, D.M., "Assessment of Technology in Organizations: Closed Versus Open Systems Approaches," Academy of Management Review, October 1979.

13. Gibson, J.L., Ivancevich, J.M., and Donnelly, J.H., Jr., Organizations, 4th ed., Business Publications, Inc., 1982.

14. Dickson, G. W., and Wetherbe, J. C., The Management of Information Systems, McGraw-Hill Book Co., 1985.

15. Galbraith, J.R., "Organization Design: An Information Processing View," in Organizational Design, Development, and Behavior, ed. Karl O. Magnusen, (Scott, Foresman and Co., 1977).

16. Kroeber, D.W., Management Information Systems, Macmillan Publishing Co., Inc., 1982.

17. Sisk, H.L., Management and Organization, 3rd ed., South-Western Publishing Co., 1977.

18. Meltzer, M.F., Information: The Ultimate Management Resource, American Management Associations, 1981.

19. Hartman, W., Matthes, A., and Proeme, A., Management Information Systems Handbook, McGraw-Hill Book Co., 1968.

20. Galbraith, J.R., Organization Design, Addison-Wesley Publishing Co., 1977.

21. Data Analysis Handbook, Naval Engineering Support Office, Alameda, California 1984.

22. Naval Air Systems Command, Naval Aviation Logistics Center/NALC-04B, Naval Aviation Logistics Data Analysis System, February, 1982.

BIBLIOGRAPHY

Davis, W.S., Systems Analysis And Design, Addison-Wesley Publishing Co., 1983.

Data Analysis Handbook, Naval Engineering Support Office, Alameda, California, 1984.

Dickson, G. W., and Wetherbe, J. C., The Management of Information Systems, McGraw-Hill Book Co., 1985.

Ein-Dor, P., and Segev, E., Managing Management Information Systems, Lexington Books, 1978.

Fink S.L., Jenk, R.S., and Willits, R.D., Designing and Managing Organizations, Richard D. Irwin, Inc., 1983.

Froehlich, A. F., Managing The Data Center, Lifetime Learning Publications, 1982

Galbraith, J.R., "Organization Design: An Information Processing View," in Organizational Design, Development, and Behavior, ed. Karl O. Magnúsen, (Scott, Foresman and Co., 1977).

Galbraith, J.R., "Designing Matrix Organization," Business Horizons, v. 14, no. 1, February 1971.

Galbraith, J.R., Designing Complex Organizations, Addison-Wesley Publishing Co., 1973.

Galbraith, J.R., Organization Design, Addison-Wesley Publishing Co., 1977.

Galbraith, J.R. and Nathanson, D.A., Strategy Implementation: The Role of Structure and Process, West Publishing Co., 1978.

Gibson, J.L., Ivancevich, J.M., and Donnelly, J.H., Jr., Organizations, 4th ed., Business Publications, Inc., 1982.

Guerry, Peter, Aerospace Engineer Technician, NESO Cherry Point, N.C., Interview, July 23, 1987.

Hartman, W., Matthes, A., and Proeme, A., Management Information Systems Handbook, McGraw-Hill Book Co., 1968.

Hellriegel, D., and Slocum, J.W., Jr., Management A Contigency Approach, Addison-Wesley Publishing Co., 1974.

Hensel, Ron, Supervisor of Reliability Maintenance, American Airlines, San Francisco, California, 10 August 1987.

Hoffman, Daryl, Aircraft Analysis Branch Head, NESO Jacksonville, Florida, Interview, July 22, 1987.

Johnson, John, Analysis Branch Head, NESO Norfolk, Virginia, Interview, July 2, 1987.

Johnson, Frank, Analysis Center Supervisor, NESO Alameda, California, Interview, June 16, 1987.

King, W.R. and Cleland, D.I., "Management-Analyst Teamwork in MIS; Cooperation Vital in System Design," Business Horizon, v. 14, no. 2, April, 1971.

Kroeber, D.W., Management Information Systems, Macmillan Publishing Co., Inc., 1982.

Lawrence, P. and Lorsch, J., Organization and Environment, Division of Research, Harvard Business School, 1967.

Lawrence, P. and Lorsch, J., Developing Organizations: Diagnosis and Action, Addison-Wesley Publishing Co., 1969.

Matzer, Joe, Supervisory Aerospace Engineer, NESO Pensacola, Florida, Interview, July 23, 1987.

Meltzer, M.F., Information: The Ultimate Management Resource, American Management Associations, 1981.

Naval Air Systems Command, Naval Aviation Logistics Center/NALC-04B, Naval Aviation Logistics Data Analysis System, February, 1982.

OPNAVINST 4790-2D, "The Naval Aviation Maintenance Program (NAMP)," v. 4, ch. 13, 02 June 1986.

OPNAVINST 4790.2D, "The Naval Aviation Maintenance Program (NAMP)," v. 1, ch.1, 02 June 1986.

Perrow, C., "A Framework for the Comparative Analysis of Organization," American Sociological Review, April, 1967.

Rousseau, D.M., "Assestment of Technology in Organizations: Closed Versus Open Systems Approaches," Academy of Management Review, October 1979.

Sisk, H.L., Management and Organization, 3rd ed., South-Western Publishing Co., 1977.

Sisson, R.L., and Canning, R.G., A Manager's Guide to Computer Processing, John Wiley and Sons, Inc., 1967.

Stoner, J.A.F., and Wankel, C., Management, 3rd ed., Prentice-Hall, Inc., 1986.

Terry, R.G., Principles of Management, 6th ed., Richard D. Irwin, Inc., 1972.

Woodward, J., Industrial Organization: Theory and Practice, Oxford University Press, 1965.

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Thesis
H528242 Hightaian
c.1 Organizational assessment of the depot level analysis center for the Lockheed S-3 Viking aircraft.